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ABSTRACT

This curriculum guide is designed to assist vocational educators in presenting an articulated, performance-based course in auto body repair. Addressed in the individual units of the course (included in 14 modules) are the following topics: safety; leadership and job communication; career preparation; shielded metal arc welding; gas metal arc welding; metalworking; body fillers; painting and refinishing; interior and exterior trim, accessories, and hardware; panel disassembly and assembly; glass replacement; basic body and frame alignment; electrical system repair and replacement; body repair estimates; and auto body live projects. Each unit contains suggested instructional times, task listings, and criterion-referenced tests. Also included in the guide are an outline of the South Carolina State Department of Education recommended program for masonry and bricklaying instruction and a discussion of the similarities between secondary and postsecondary education. Appendixes to the guide include sample articulation agreements, a list of definitions, a discussion of the philosophy and objectives of the articulation guide, directions for the tests, and an analysis of secondary instructional times. (MN)

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ED246265

ARTICULATED, PERFORMANCE-BASED INSTRUCTION OBJECTIVES GUIDE
FOR
AUTO BODY REPAIR

DEVELOPMENT PERIOD
JULY, 1983 - JUNE, 1984

PREPARED BY
OCCUPATIONAL EDUCATION ARTICULATION PROGRAM
TASK FORCE COMMITTEE
FOR
AUTO BODY REPAIR
REPRESENTING
THE SCHOOL DISTRICT OF GREENVILLE COUNTY
AND
GREENVILLE TECHNICAL COLLEGE
GREENVILLE, SOUTH CAROLINA

PUBLICATION OF
OCCUPATIONAL EDUCATION ARTICULATION PROGRAM
OF THE SCHOOL DISTRICT OF GREENVILLE COUNTY
AND GREENVILLE TECHNICAL COLLEGE

CE039312

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EDITION I

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ARTICULATED, PERFORMANCE-BASED CURRICULUM GUIDE

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ARTICULATION GUIDE

THE SCHOOL DISTRICT
OF GREENVILLE COUNTY
AND
GREENVILLE
TECHNICAL COLLEGE

THE SCHOOL DISTRICT OF GREENVILLE COUNTY
GREENVILLE, SOUTH CAROLINA

1984

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ACKNOWLEDGEMENT

The Articulated, Performance-based Instruction Objectives Guide for Auto Body Repair is the product of the work of the following instructor Task Force Committee participants representing the secondary programs of The School District of Greenville County and the post-secondary similar program at Greenville Technical College.

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The cooperation of the instructor participants and others representing The School District of Greenville County, Greenville Technical College, the South Carolina State Department of Education, and the South Carolina State Board for Technical and Comprehensive Education is appreciated.

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Many ideas and models, however, have evolved from years of research and experience and often are difficult to precisely credit.

The objectives and task actions of the articulated guides are developed or contributed by task force committee (instructor) participants based on their expertise and on task lists from resources such as V-TEC Catalogs. Standards included in guides are those identified by local potential employers as important to the success of entry level workers. Sample knowledge and performance tests are included to represent valid and reliable test items that may be used to measure mastery of objectives. Test samples taken from texts or workbooks typically are those being used locally and appropriate documentation has been included.

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Wm. Edward Henderson Jr., Coordinator
Occupational Education Articulation Program
The School District of Greenville County
and Greenville Technical College
1983

ABSTRACT

Title of Program: Occupational Education Articulation Program

Program Coordinator: Wm. Edward Henderson Jr.

Sponsoring Agencies: The School District of Greenville County
and Greenville Technical College
c/o P.O. Box 2848 - 301 Camperdown Way
Greenville, SC 29602

Program Development Period: July 1, 1983 through June 30, 1984

PURPOSE To develop a continuous line of vocational training in similar Auto Body Repair programs so that students may continue their career/vocational education at the secondary and post-secondary levels without loss of time or waste of effort in repeating tasks that have been mastered previously.

To provide a system where teachers can cooperate effectively in providing a continuous occupational development program where the level and type of training that leads to entry-level employment skills will be clear to students, teachers, other educators, and potential employers.

METHOD: Auto Body Repair instructor representatives from the two secondary level career centers of The School District of Greenville County and the post-secondary level Auto Body Repair Department Head from Greenville Technical College were brought together in task force committee meetings and workshops to survey very similar areas of vocational training to identify possible overlaps or gaps as students continue auto body training from the secondary level to the post-secondary level. In addition, lateral articulation of machine shop programs at the secondary level was promoted.

This Articulated, Performance-based Instruction Objectives Guide for Auto Body Repair, was developed by the Task Force Committee on Auto Body Repair to facilitate articulation. The Task Force Committee,

by the task analysis process, identified the minimum essential competencies for the secondary auto body repair graduate to continue training at the next higher level of education or for successful initial entry into the labor market in the trade. Major objectives for competency were stated, performance to obtain the objectives were clarified, enabling actions were identified and placed in sequential order, instruction time was estimated, and performance standards were stated. Finally, outcome-referenced (criterion-referenced) measures of performance were developed as a guide in articulating (articulation).

RESULTS: As a result of the project development phase, the Articulated, Performance-based Instruction Objectives Guide for Auto Body Repair was developed. This articulation guide, however, is not a final product since it must be field trial tested and revised. Modifications and improvements to the guide are expected since the process of education must be continually reviewed to ensure that objectives are valid and are being met as best they can be met under given conditions.

Prior to development of this articulation guide, an Articulation Policies and Procedures Guide was developed to aid articulation activities and was used to direct program and product (guide) development activities.

Workshop guides, developed and refined during an earlier phase of the program, were used to assist task force committee participants in obtaining task analysis data, writing performance-based objectives, identifying performance actions to reach the objectives, stating performance standards, and developing outcome-referenced tests. These how-to-do-it guides are usable at the instructional level as well as at the supervisory level.

PREFACE

This Articulated, Performance-based Instruction Objectives Guide is based on the following ASSUMPTIONS:

1. The grouping of tasks is more conducive to skill development in vocational education.

2. Potential employers probably would prefer an employee well educated in the basics with more detailed on-the-job training provided by the employer.

3. Among topics that should be included in vocational education are; safety, career opportunities, how to get and keep a job, and the job attitudes that often are the key to employee success and job retention.

4. A premise of the articulated, performance-based instruction guide is that it is absolutely essential that career/vocational education/training be based on the knowledges, skills, abilities, and personal characteristics that are important to success on the job, if the vocational program is going to validly serve the needs of students and potential employers of the community.

5. Another premise in the articulated instruction guide is that vocational education can no longer be developed according to program titles, be time-based, lack flexibility, or overlook basic fundamentals if the program is to meet the needs of a constantly changing workforce, meet the needs of students and employers, and be of the highest quality.

6. Substantial research clearly indicates that instructional technology and accountability demands are increasing the movement toward the use of instructional systems.

   The systems approach, a method of organizing the instructional situation, methods, media, materials, and equipment so that the maximum knowledge and skill development may be achieved, is promoted because it directs its attention toward teaching the observable behaviors that the vocational student should possess at the termination of instruction.

   The instructional program described in this articulated, performance-based instructional objectives guide has been assembled by participating instructor task force committee representatives representing The School District of Greenville

County and Greenville Technical College and it is based on the concept that the minimum tasks described should be those identified for successful entry level employment according to local task analysis information, state-of-the-art literature, similar/related research/publications, and the expertise of the instructor participants.

7. The articulated instruction guide illustrates one way the (secondary) curriculum may be organized. The example is not intended to imply that there are not other ways to structure the curriculum.

   The articulated instruction guide should be preceived as a vehicle to facilitate the development of alternate, detailed instructional plans for the individual learner.

8. While the objectives in this guide typically have been arranged in a sequence from less to more difficult in performance or as they might occur on the job, the sequence of tasks is not meant to indicate a required pattern.

9. The "suggested minimum instruction times" are included for planning purposes and may be extended as required for the completion of task objectives. An underlying premise of the articulated instruction guide is that it is more desirable for the student to complete some objectives and gain some employable skills rather than to be introduced to a large number of tasks and not acquire any employable skills.

   The actual amount of time required for each task objective may vary according to the local program objectives and depending upon the individual needs of the learner, the instructor, and the facilities/materials available.

10. While it may become necessary to modify the vocational program from the articulated guide description, a lowering of the minimum standards (competency level) recommended (typically by industry) should be avoided to ensure that the program graduate can demonstrate a minimum performance essential to employment success.

11. This articulation guide was drafted in a period of less than twelve months so that a product production deadline of twelve months might be met.

    If the vocational program was too complex to describe in one-year because of the number of major tasks, emphasis was placed on successfully describing the first year of the two-year, secondary level, vocational program so that there would be a foundation for further development. Completion of the second year program tasks were described as the remaining time allowed.

    Because of a restricted development time frame, emphasis was placed on developing a sound and valid articulation guide which might be refined at a later date.

Greenville, SC

W.E.H.

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AUTOMOTIVE BODY REPAIR I

LEVEL: Secondary

TITLE: Automotive Body Repair I

DESIGNATION: AUTO BODY REP I COMPUTER NUMBER: 780

DESCRIPTION: Auto Body Repair is designed to provide the student with training in the technical knowledge and basic skills of auto body repair through classroom instruction and shop experiences.

During the first year, emphasis is on building fundamental skills in welding, leading, brazing, metal shaping, straightening and smoothing, and refinishing. First year students typically learn their skills working on old hoods, deck lids, turret tops, etc., with work on live vehicles reserved primarily for second year students. First year students learn to weld breaks or cuts in parts, rough parts into their original shape, smooth through dollying, and fill with lead or plastic body fillers.

Classroom subjects typically representing approximately the first four weeks of the first year include: Orientation to auto body repair; career exploration; safety; basic instruction in use of hand tools, power equipment such as the disc grinders and sanding machines, acetylene welding equipment fundamentals necessary to begin practicing repairs of damaged sheet metal parts such as hoods, fenders, and deck lids; as well as oxy-fuel welding, soldering, leading, and brazing.

Addition topics that generally are covered during the first year are; introduction to abrasives, metal bumping and straightening, refinishing, and fastening devices.

OBJECTIVE: By the end of the first year, the Auto Body Repair student should be able to explain the career requirements and opportunities of the auto body repair field. The student should have developed the minimum knowledge, skills, and attitudes essential to the use of basic hand tools such as; hammers, dollies, body files, grinders, and sanders as well as welding, brazing, and leading tools in metal shaping and smoothing.

PERFORMANCE EVALUATION: Evaluation of competency will be by outcome-referenced tests with emphasis on transfer type tests and measures of job performance. Competencies will include; identifying and selecting materials, operating and maintaining tools and equipment, performing metal and non-metal repairs, refinishing surfaces, removing and replacing parts, removing and replacing interior and exterior trim, and describing careers requirements and opportunities in auto body repair.

PREREQUISITIES: None

Suggested Grade Level: 11

SUGGESTED PREPARATION: For optimum success, the auto body student should possess the math skills to accurately measure in fractions with a ruler, to read metric measurements, to figure ratio and proportions for mixing paints, and to perform addition and subtraction to estimate the cost of repairs.

The auto body student must be able to read and understand terminology such as melting point, clearance, and air pressure. The repairman must be able to read and follow instructions in sequence and understand technical product information and part/supply manuals/catalogs.

Helpful high school courses for the Auto Body student include; Applied Math, Physical Science, Industrial Arts, Prevocation, and Art.

REQUIRED INSTRUCTION HOURS:

System	Year
Division	Class/Lab
Credits	3
Hours	540

LEVEL: Secondary

TITLE: Automotive Body Repair II

DESIGNATION: AUTO BODY REP II COMPUTER NUMBER: 781

DESCRIPTION: Students who have demonstrated the special interest, aptitude, and ability for Auto Body Repair II will continue their preparation to enter employment in the auto body repair field or to continue their career training at Greenville Technical College.

Second year students will learn to repair and align auto bodies and frames, as shop equipment allows, and the fundamentals of removing and installing glass. Students will refinish and paint small parts or sections to learn the effects of undercoating colors and different kinds of paints such as enamels, lacquers, and acrylics.

Advanced skills taught during the second year of auto body training typically will feature: Electrical systems; trim, accessories, and hardware; glass replacement; (MIG) welding advanced panel repair and replacement; advanced body and frame alignment; painting and refinishing; and estimating and appraising costs of repairs.

OBJECTIVE: The second year of training will emphasize: Safety; advanced skills with power equipment and tools; advanced practices in oxy-fuel welding, brazing, soldering and arc welding; detailed instruction in abrasives; metal bumping and straightening; detailed automotive finishing as well as body and frame construction; use of shop manuals, specifications, etc.; and body hardware and trim.

Second year shop work will feature added practice in welding, brazing, leading, metal straightening, use of plastic fillers and refinishing. Emphasis will be on jobs with minor collision damage including refinishing damages sections and exterior trim such as moldings, bumpers, etc., and the replacement of some glass.

Upon completion of the second year of training, the graduate should be prepared to successfully enter the trade as a knowledgeable apprentice.

PERFORMANCE EVALUATION: Given typical auto collision situations or automobile bodies needing refinishing, the necessary tools, equipment, machines, and materials, the Auto Body Repair graduate will be able to examine damaged vehicles and estimate costs and repairs. Additional competencies that the graduate will be able to demonstrate include: Remove and replace upholstery, accessories, electrical window-and-seat-operating equipment, and body trim to gain access to the vehicle body and fenders. Remove and replace glass. Place dolly block against surface of dented areas and beat opposite surfaces with hammer to remove dents. Fills depressions with solder or plastic material. Removes excessively damaged fenders, panels and grills, using wrenches and cutting torch, and attaches replacements by bolting or welding them in position. Straightens bent frames using hydraulic jack and pulling device. Files, grinds, and sands and repairs surfaces by painting with a primer coat and sanding it smooth. May finish paint surfaces after performing body repairs. In addition, the Auto Body Repair graduate will be able to aim headlights, repair and replace brakes, air conditioning, and cooling systems as necessary to repair metal damage.

The graduate's performance should meet the minimum industry standards as described in this Articulated, Performance-based Instruction Objectives Guide for Auto Body Repair.

Through outcome-referenced measures of knowledges and skills, the graduate will demonstrate the competencies expected to enter employment and perform successfully in auto body repair or a directly related field.

Paper-and-pencil type testing should emphasize transfer type tests to encourage the prediction of success at the next higher level of learning or on the job.

ADDITIONAL OBJECTIVES AND SKILLS: Advanced secondary students who are able to pursue individualized study or who wish to continue their career preparation at the post-secondary level should develop skills and knowledges in the following areas: Straightening, replacement and alignment of body parts; frame straightening; major collision repair; job estimating and cost control and appraisal.

PREREQUISITES: Automotive Body Repair I

Suggested Grade Level: 12

REQUIRED INSTRUCTION HOURS:

System	Year
Division	Class/Lab
Credits	3
Hours	540

TOTAL REQUIRED INSTRUCTION HOURS FOR SECONDARY PROGRAM:

System	2-Years
Division	Class/Lab
Credits	6
Hours	1,080

WORKING CONDITIONS:

The Auto Body Repairman should like to work with objects and things, to do simple operations perfectly, and to effectively work with colors and textures.

The repairman should be prepared to perform a variety of duties which may change often, to work with precise limits or standards of accuracy, to rate information using measureable standards, to figure cost-time estimates for jobs, to work with minimum supervision and take responsibility, and to pay attention to details.

The Auto Body Repairman should be physically fit. The repairman should see well, with correction as necessary, and should have satisfactory color vision. The repairman should have good eye-hand coordination and should be prepared to work with a variety of power tools. Typically, work requires the repairman to reach, bend, stoop, squat, stretch or to work in cramped, uncomfortable positions for long periods of time. The lifting of heavy objects, high noise, fumes, and dust are experienced in the job.

JOB QUALIFICATION:

Auto Body and Fender Repairman, Code 17.0301
Auto Body Repairman, D.O.T. 807.381-010
Shop Estimator, D.O.T. 807.287-010
Auto Painter, D.O.T. 807.781.018

The Auto Body Repair graduate at the secondary level after successfully completing the minimum program outlines in the Articulated, Performance-based Instruction Objectives Guide for Auto Body Repair will be qualified to enter the auto body field as an apprentice repairman.

The primary areas of employment are the auto body repair shop, typically found in the dealership, and related industries.

Job areas might include: Auto body workman, automobile-collision serviceman, body-and-fender repairman, body-line finisher, body man, dent remover, dingman, fender-and-body repairman, hammer-out man, metal shrinker, metal worker, metal touch-up finisher, automotive glass installer and frame repairman.

Related work might be found as part counterman or parts salesman.

EMPLOYMENT PROJECTION
AUTO BODY REPAIRER

The South Carolina Employment Security Commission has projected a growth of approximately 27.3 percent in Auto Body Repairers in the Greenville-Spartanburg area between 1978 and 1985. This growth represents an estimated expansion of approximately 20 jobs from 1983 to 1985 when the estimated total tradesmen should be around 360. This number may not fully represent the number of practicing auto body repairers that may be earning their living in the field, possibly as small businessmen or in related service businesses.

<ins>South Carolina Occupational Projections, 1978-1985</ins>, Columbia, SC: South Carolina Employment Security Commission (Research & Analysis Department), p. 158, 1982.

SECONDARY LEVEL
STATE DEPARTMENT OF EDUCATION
RECOMMENDED PROGRAM

AUTO BODY REPAIR

The South Carolina State Department of Education suggests that the high school Auto Body Repair vocational education program should consist of the basic technical knowledges and skills that are necessary for the graduate to succeed in auto body repair work or a directly related field. Classroom instruction introduces the student to the fundamentals of the trade while shop experiences provide an opportunity for supervised repairs of actual collision work or auto body refinishing. The State Department of Education suggests that the secondary vocational program should include (but not be limited to):

1. Safety tools and equipment
2. Welding
3. Soldering
4. Plasticizing
5. Parts replacement
6. Panel replacement
7. Metalworking
8. Body and parts alignment
9. Air supply and equipment
10. Hydraulic jacking equipment
11. Mechanical repair
12. Refinishing
13. Electrical repair
14. Glass installation
15. Upholstery installation
16. Frame straightening
17. Supplies
18. Estimating

Outline of High School Credit Courses, Columbia, SC: SC State Department of Education, p. 125 (locally edited).

POST-SECONDARY LEVEL DESCRIPTION
GREENVILLE TECHNICAL COLLEGE

AUTO BODY REPAIR

The automotive body repair and painting field is requiring an increasing number of well-trained tradesman to meet the growing demands for service in the repair and care of vehicles. After gaining additional experience, many of these craftsmen choose to become self-employed businessmen, body shop foremen, supervisors, or managers.

The post-secondary Auto Body Repair program is a four quarter diploma program offering training in the technical and manual skills required for realignment, repair, and refinishing of motor vehicles.

The suggested sequence of required courses is:

FIRST QUARTER

COURSE NUMBER	COURSE TITLE	CLASS	LAB	CREDIT
MAT 112	Applied Math I	5	0	5
ABR 101	Tools and Equipment	2	3	3
ABR 111	Structural Repair I	4	9	7
ABR 141	Auto Sheet Metal & Frame Gas Welding	2	3	3
		13	15	18

SECOND QUARTER

ABR 112	Auto Sheet Metal Repair I	6	3	7
ABR 121	Structural Repair II	6	3	7
ABR 146	Shop Management	5	0	5
ECO 100	Consumer Economics	3	0	3
		20	6	22

THIRD QUARTER

ABR 116	Refinishing I	4	6	6
ABR 122	Auto Sheet Metal Repair II	4	3	5
ABR 134	Trim and Glass	2	6	4
PSY 112	Industrial Human Relations	3	0	3
		13	15	18

FOURTH QUARTER

ABR 123	Estimating Repairs	4	3	5
ABR 132	Auto Sheet Metal Repair III	2	3	3
ABR 126	Refinishing II	1	9	4
ABR 118	Processes and Products	1	0	1
ENG 126	Communications I	3	0	3
		11	15	16

Source: Industrial Division, Greenville Technical College, 1982-1984 Catalog, Greenville, SC: Greenville Technical College, Auto Body Repair Department, pp. 4-5, 1983.

FIRST QUARTER

MAT 112 APPLIED MATH I:

"Review of basic operations of arithmetic and an introduction to elementary algebra through linear equations in one unknown. Industrial applications. Prerequisite: Satisfactory score on math placement test." (5-0-5)

ABR 101 TOOL AND EQUIPMENT:

"Covers identification, proper usage, safety and maintenance to be followed in the use of hand tools, power tools and special devices used in repairing automobile bodies. Demonstrations and practice sessions will be utilized to teach the student proper procedure." (2-3-3)

ABR 111 STRUCTURAL REPAIR I:

"A study of the automotive body frame and its related parts. Through demonstrations and practical projects, the student will learn methods of checking and correcting the alignment of the automotive body." (4-9-7)

ABR 141 AUTO SHEET METAL & FRAME GAS WELDING:

"In this course the student will study the basic theory and acquire skill in practice of gas welding, brazing, heating, and shrinking and cutting of auto sheet metal and frame repair." (2-3-3)

SECOND QUARTER

ABR 112 AUTO SHEET METAL REPAIR I:

"Emphasis is placed on the identification and use of tools in preparing metal for refinishing. "Bumping" and "dinging" are demonstrated by the instructor and practiced by the student. Materials and equipment used in grinding, smoothing, and filling are covered in detail. Soldering and brazing techniques are learned." (6-3-7)

ABR 121 STRUCTURAL REPAIR II:

"Repair of frames, body shells, and unit systems using frame straightening equipment. Students will become proficient in analyzing structural damage and repair of damaged members and units." (6-3-7)

ABR 146 SHOP MANAGEMENT:

"An introduction to the business world, problems of small business operation, basic business law, business forms and records, financial problems, ordering and taking inventory, layout of equipment and offices and methods of improving business and employer/employee relations." (5-0-5)

ECO 100 CONSUMER ECONOMICS:

"Emphasizes the role of the consumer in our society. It includes consumer decision making, money and marital happiness, money management, consumer credit, intelligent shopping, financing a home, transportation, health services, estate planning, and consumer protection." (3-0-3)

THIRD QUARTER

ABR 116 REFINISHING I:

"A study of the equipment and materials used in painting and refinishing. The properties handling and application of standard lacquer, enamel, and acrylic lacquers are covered. Primers and their application over body fillers are covered in detail. Operations and maintenance of spray painting equipment, use of proper thinners, taping and overall preparation of the auto body are covered with emphasis on the applied phases of the work." (4-6-6)

ABR 122 AUTO SHEET METAL REPAIR II:

"An analysis of complex damaged areas. The student learns to use a variety of techniques and operations in the repair of sheet metal components, including doors and hoods. (4-3-5)

ABR 134 TRIM AND GLASS:

"A study of automobile trim which includes door panel, headliners, upholstery, etc., and the removal and installation of trim and glass." (2-6-4)

PSY 112 INDUSTRIAL HUMAN RELATIONS:

"Provides supervised experience and instruction designed to help the student recognize and develop the traits necessary for good relations with fellow workers, supervisors, subordinates, customers, and others. Through exercises involving awareness, self-concept and self-evaluation, role-playing, and group and individual problem solving the course helps to develop improved interpersonal relationships." (3-0-3)

FOURTH QUARTER

ABR 123 ESTIMATING REPAIRS:

"The student will learn to determine whether body parts are repairable or must be replaced. Estimation of time needed to make necessary body repairs, if the wrecked vehicle is repairable or should be declared a total loss, are covered in detail. Usage of repair manuals, crash books, parts books, and flat rate manuals together with labor time involved teach the student how to arrive at a dollar and cents estimate where the repairman can show a reasonable profit." (4-3-5)

ABR 132 AUTO SHEET METAL REPAIR III:

"A study of advanced techniques of metal repair, fiberglass, and aluminum material. Students apply previously acquired skills on new metals and synthetics." (2-3-3)

ABR 126 REFINISHING II:

"This course covers a more thorough indepth study and practice of refinishing automobiles using real work projects, such as panel repair, spot repair and overall paint work." (1-9-4)

ABR 118 PROCESSES & PRODUCTS:

"Students learn the characteristics, uses, and advantages of the various body repair products in common use in the industry. Application and finishing techniques of the products are emphasized." (1-0-1)

ENG 126 COMMUNICATIONS I:

"An intensive review of English grammar and an introduction to expository writing to develop the competence needed to communicate effectively on and off the job." (3-0-3)

MODULE 1.0

Module 1.0, Introduction/Orientation, has been designed to represent introductory requirements of the vocational program such as course policies, procedures, and safety regulations; leadership training, desirable work attitudes and habits that potential employers recommend be incorporated in secondary instruction; career information; and basic math and related skills necessary for success in the vocation.

Some task objectives that are described in this first module naturally will be learned early in the instructional program while competencies in other tasks may result during the first year or second year. For example, students must understand the policies of the program very early in the first year but may not develop competencies in job attitudes or career information until the second year. Job habits and attitudes typically will be taught during the entire two year training program.

Units in this module:

UNIT 1.0 A	INTRODUCTION/ORIENTATION
UNIT 1.0 B	INTRODUCTION TO SAFETY
UNIT 1.0 C	INTRODUCTION TO LEADERSHIP/ JOB COMMUNICATIONS
UNIT 1.0 D	PREPARING FOR WORK
UNIT 1.0 E	INTRODUCTION TO DESIRABLE JOB/LEARNING CHARACTERISTICS/HABITS/ATTITUDES
UNIT 1.0 F	BASIC MATH SKILLS
UNIT 1.0 G	BASIC MEASURING

AUTO BODY
INTRODUCTION/ORIENTATION
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 1.0 A	INTRODUCTION/ORIENTATION	
1.01	Review/Follow Career Center Policies and Procedures	3
1.02	Orientation to Vocational Program Classroom/Shop/Lab	1
1.03	Review Course Objectives and Standards	3
Unit 1.0 B	INTRODUCTION TO SAFETY	
1.01	General Orientation	1
1.02	Identify Desirable Vocational Training Safety Habits	1
1.03	Observe Classroom Safety Practices	1
1.04	Apply Fire Safety Rules and Procedures	1
1.05	Apply Electrical Safety Rules and Procedures	1
1.06	Personal Safety	1
Unit 1.0 C	INTRODUCTION TO LEADERSHIP/ JOB COMMUNICATIONS	
1.01	Work Cooperatively With Fellow Students	N/A
1.02	Demonstrate Desirable Characteristics of Leadership	N/A
1.03	Participate in VICA Club Activities	N/A
1.03	Demonstrate Proper Use of Parliamentary Procedure	N/A
1.03	Communicate a Message by the Medium of a Speech	N/A

Unit 1.0 D	PREPARING FOR WORK	
1.01	Describe the Free Enterprise System and the Difference Between Labor and Management	N/A
1.02	Interpret Labor Laws and Regulations	1/2
1.03	Interpret Payroll Deductions for Taxes, etc.	1/2
1.04	Identify Typical Career Opportunities	1
1.05	Locate Job Opportunities	2
1.06	Prepare Resume	2
1.07	Compose Application Letter	*
1.08	Complete a Typical Employment Application Form	3
1.09	Interview for a Job	*
1.10	Compose Follow-up Letter	*
1.11	Identify Post-secondary Career Development Opportunities	6
Unit 1.0 E	INTRODUCTION TO DESIRABLE JOB/ LEARNING CHARACTERISTICS/ HABITS/ATTITUDES	
1.01	Describe Good Work Habits	N/A
1.02	Exhibit Successful Job Performance Characteristics	3
1.03	Exhibit Desirable Work Attitudes	3
1.04	Demonstrate Respect for and Care of Auto Body Property	N/A
Unit 1.0 F	BASIC MATH SKILLS	
1.01	Basic Math - Fractions	14
1.02	Basic Math - Decimals	*
1.03	Basic Math - Volumes	*

1.04	Basic Math - Areas	**
1.05	The Metric System	**
Unit 1.0 G	BASIC MEASURING	
1.01	Measuring	*
	TOTAL	49

 * Integrated training
** Combined training

TASK LISTINGS
AUTO BODY

MODULE/TASK DESCRIPTION

Unit 1.0 A INTRODUCTION/ORIENTATION

1.01 (Review/Follow Career Center Policies and Procedures) Given information on career center policies and procedures, apply these policies and procedures on a day-to-day basis.

1.02 (Orientation to Vocational Program Classroom/Shop/Lab) Given information on classroom/shop or instructor's policies and procedures, apply these policies and procedures on a daily basis, meeting the standards of the instructor 100 percent.

1.03 (Review Course Objectives and Standards) Given an introduction to the vocational program, a review of the course objectives and minimum standards of performance; describe the course objectives, and the minimum performance expected to demonstrate competency in given objectives.

Unit 1.0 B INTRODUCTION TO SAFETY

1.01 (General Orientation) Given an orientation to building, shop, and fire safety; discuss, identify, or demonstrate general shop safety behavior and fire procedures.

1.02 (Identify Desirable Vocational Training Safety Habits) Given an introduction/orientation to general safety as well as to safety in the vocational education program or on the job; identify general occupational safety habits to the satisfaction of the instructor and meet all applicable safety rules and regulations.

1.03 (Observe Classroom Safety Practices) Given a typical vocational classroom/shop/lab or job situation, exhibit an awareness of safety practices, safe work habits, and a positive attitude concerning job safety and accident prevention and meet standards established by the instructor.

1.04 (Apply Fire Safety Rules and Procedures) Given examples of types of fires, fire extinguishers, and possible shop situations, apply fire safety rules and procedures. Meet National and local fire safety procedures.

1.05 (Apply Electrical Safety Rules and Procedures) Given orientation to identifying electrical hazards, apply electrical safety rules and procedures. Electrical equipment with exposed wire, frayed cables, and deteriorated insulation must be reported and corrected. Proper grounding must be employed and maintained. Junction boxes, outlets, switches, breakers switches, and panels should be identified as to their use. Meet all applicable National and local standards and the standards of the instructor.

1.06 (Personal Safety) Given instruction, identify personal safety clothing, equipment, or procedures to ensure safety in the vocational field/training, with 100 percent accuracy, demonstrate proper use of safety behavior.

Unit 1.0 C INTRODUCTION TO LEADERSHIP/JOB COMMUNICATIONS

1.01 (Work Cooperatively With Fellow Students) Given instruction and an opportunity to meet fellow students in the vocational program environment, work cooperatively with fellow students as well as with other students in related vocational learning activities. Meet the instructor's standards and cooperate to the satisfaction of fellow students as a group.

1.02 (Demonstrate Desirable Characteristics of Leadership) Given an introduction/orientation to desirable qualities of a good leader, describe characteristics typical of a good leader, discuss desirable leadership qualities, and demonstrate an ability to follow as well as take a leadership position. Performance should be satisfactory to the instructor and fellow students.

1.03 (Participate in VICA Club Activities) Given an introduction/orientation to the Vocational Industrial Club of American (VICA), describe the general purposes of VICA, describe a typical VICA program at a vocational center, recall from memory the VICA motto, state the VICA pledge from memory, identify the symbols/symbolism in the VICA emblem, identify what the colors of the VICA organization represent. Performance should be acceptable to the VICA Club sponsor, instructor, and VICA club members.

1.03 (Demonstrate Proper Use of Parliamentary Procedure) Given instruction, apply the principles of parliamentary procedure and describe the characteristics of a good chairman.

1.03 (Communicate a Message by the Medium of a Speech) Given instruction, list purposes of a speech, characteristics of a speech, and write and orally deliver a speech. The delivered speech should contain accurate information, be technically correct in organization and delivery, and the intended message should be communicated.

Unit 1.0 D PREPARING FOR WORK

1.01 (Describe the Free Enterprise System and the Difference Between Labor and Management) Given an introduction/ orientation to the free enterprise system of economics, describe to the satisfaction of the instructor the free enterprise system of economics as found in the United States and describe the relationship between labor and management.

1.02 (Interpret Labor Laws and Regulations) Given instruction, necessary references concerning labor laws and regulations, interpret typical labor laws and regulations. Performance must meet the instructor's standards.

1.03 (Interpret Payroll Deductions for Taxes, etc.) Given instruction and sample forms concerning income tax and other withholdings, interpret the typical forms used in income tax and other withholdings to the satisfaction of the instructor and itemize typical payroll deductions that worker encounters. Performance must be to the instructor's standards.

1.04 (Identify Typical Career Opportunities) Given instruction, data on the local business and industry, opportunities to study entry-level job opportunities; identify the major catagories of potential employers in the local community (and the key characteristics of each).

1.05 (Locate Job Opportunities) Given job placement information such as newspaper ads and personal contacts, list a minimum of ten specific jobs in the community. One week will be allowed to complete the task.

1.06 (Prepare Resume) Given examples of suitable resume/ personal data sheets, prepare and type (or print at a minimum) a personal resume on paper acceptable to the instructor with all errors acceptable corrected.

1.07 (Compose Application Letter) Given a newspaper ad for a job, compose a letter of application. The letter must be mailable and must include all necessary personal information.

1.08 (Complete a Typical Employment Application Form) Given an employment application form typical of the job, complete the form with all information accurate, neatly typed or printed in, and aligned in the form blanks.

1.09 (Interview for a Job) Given instruction on how to interview for a job, a job interview checklist, and a mock job interview; complete a job interview to the satisfaction of the instructor.

1.10 (Compose Follow-up Letter) Given a case situation by the instructor or from the textbook, compose and write a follow-up letter appropriate to the job application or interview situation and in mailable form. The finished letter must meet the instructor's standards.

1.11 (Identify Post-Secondary Career Development Opportunities) Given an orientation to similar post-secondary career development programs, such as offered at Greenville Technical College, a report of skill competencies developed during secondary training, and other information as needed; identify post-secondary career development opportunities.

Unit 1.0 E INTRODUCTION TO DESIRABLE JOB/LEARNING CHARACTERISTICS/HABITS/ATTITUDES

1.01 (Describe Good Work Habits Important to Job Success) Given introduction/orientation to desirable work habits, as described by potential employers or tradesmen, demonstrate desirable (good) work habits (based on information provided by the instructor) represent typical standards expected by business/industry (potential employers) for entry employment success.

1.02 (Exhibit Successful Job Performance Characteristics) Given instruction, demonstrate job performance characteristics that are considered important to entry-level career success in the vocational field. A "Job Performance Rating Sheet" will be used to evaluate performance and all items must be rated "frequently" or above.

1.03 (Exhibit Desirable Work Attitudes) Given instruction, demonstrate work attitudes that the majority of potential employers prefer in an entry level worker. Performance will be evaluated on a "Work Attitudes Score Card" and a minimum of 90 percent should be attained. Performance will be rated throughout training and should improve to 100 percent by the end of the training period.

1.04 (Demonstrate Respect for and Care of School Property) Given a classroom, shop, or other instruction setting with access to furniture, equipment, tools and materials and given proper instruction; demonstrate a respect for and care of public property (training facilities) and instructional materials to the standards established by The School District of Greenville County, career center, and instructor.

Unit 1.0 F BASIC MATH SKILLS

1.01 (Basic Math - Fractions) Given a pretest or examples by the instructor, conduct the following operations with fractions:

1. Change any fraction to a decimal number, and any terminating decimal number to a fraction.
2. Arrange in order...unit and simple nonunit fractions.
3. Write equivalent fractions in higher, lower, and lowest terms.
4. Write improper fractions as whole or mixed numbers, and mixed numbers as improper fractions.
5. Multiply fractions and mixed numbers, expressing answers in simplest form.
6. Divide fractions and mixed numbers, expressing answers in simplest form.
7. Add and subtract unlike fractions, expressing answers in simplest form.
8. Add and subtract mixed numbers with unlike fractions, expressing answers in simplest form.
9. Use rational numbers to solve simple work problems.

1.02 (Basic Math - Decimals) Given a pretest or examples by the instructor, conduct the following decimal math operations:

1. Name the place value of digits in decimal numbers of up to nine digits before the decimal and six digits after the decimal.
2. Compare decimal numbers and arrange them in proper order.
3. Write the numeral for any decimal number of up to four decimal places.
4. Round decimal numbers to any designated place value up to thousandths.
5. Add and subtract decimal numbers of up to six digits.
6. Multiply decimal numbers by whole numbers or decimal numbers.
7. Divide a number by a three-digit decimal number.
8. Multiply and divide decimal numbers by powers of ten, by inspection.

1.03 (Basic Math - Volumes) Given a pretest or examples by the instructor, find the volume of any rectangular prism or cube.

1.04 (Basic Math - Areas) Given a pretest or examples by the instructor, find the area of the following types of figures:

a. Rectangle and square
b. Circle

1.05 (The Metric System) Given basic instruction in the metric system and conversion from United States Customary units to metric; read and convert specifications and dimensions from one system into the other system on teacher or text assigned problems with 100 percent accuracy.

Unit 1.0 G BASIC MEASURING

1.01 (Measuring) Given proper instructions, read a rule and use other measuring tools with the precision necessary to take measurements or set them up.

UNIT 1.0 A

INTRODUCTION/ORIENTATION

UNIT 1.0 A INTRODUCTION/ORIENTATION

TASK 1.01 REVIEW/FOLLOW CAREER CENTER POLICIES AND PROCEDURES

PERFORMANCE OBJECTIVE:

Given information on career center policies and procedures, apply these policies and procedures on a day-to-day basis.

PERFORMANCE ACTIONS:

1.0101 Review center policies and procedures.

1.0102 Review relevant philosophy of center and, The School District of Greenville County, and the South Carolina State Department of Education.

1.0103 Review relevant safety policies and procedures under unit concerning safety, and practice desired safety behavior as outlined in relevant safety policies and procedures.

PERFORMANCE STANDARDS:

- Using information and materials supplied, review and apply career center policies and procedures daily.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Center Student Handbook.
- High School Student Handbook.
- Written Policies and Procedures of The School District of Greenville County.
- Policies and Procedures of the South Carolina State Department of Education.
- "Authorization" and "release" forms (such as safety releases).

UNIT 1.0 A	INTRODUCTION/ORIENTATION
TASK 1.02	ORIENTATION TO VOCATIONAL PROGRAM CLASSROOM/SHOP/LAB

PERFORMANCE OBJECTIVE:

Given information on classroom/shop or instructor's policies and procedures, apply these policies and procedures on a daily basis, meeting the standards of the instructor 100 percent.

PERFORMANCE ACTIONS:

1.0201 Review with instructor the shop policies and procedures.

1.0202 Apply, with 100 percent accuracy, the policies and procedures for the vocational program, shop, or of the instructor.

PERFORMANCE STANDARDS:

- Apply information/instruction given during orientation and throughout training period to comply with all policies and procedures of the shop (instructor) on a day-to-day basis.
- Standards of the State, School District, Career Center, and high school, and instructor apply.

SUGGESTED INSTRUCTION TIME: 1 Hour

RECOMMENDED:

- Vocational education (shop) policies and procedures should be written and posted or distributed to students.

UNIT 1.0 A INTRODUCTION/ORIENTATION

TASK 1.03 REVIEW COURSE OBJECTIVES AND STANDARDS

PERFORMANCE OBJECTIVE:

Given an introduction to the vocational program, a review of the course objectives and minimum standards of performance; describe the course objectives, and the minimum performance expected to demonstrate competency in given objectives.

(NOTE: This task may be accomplished in general at the beginning of the first year and in detail over the two year training period.)

PERFORMANCE ACTIONS:

1.0301 Review each major objective of the vocational program as outlined in this articulated, performance-based instruction objectives guide.

1.0302 Review the minimum performance standards of the objectives.

Possible Alternate Actions:

Instructor may require students to identify objectives and standards at the initiation of each new unit of instruction.

PERFORMANCE STANDARDS:

- Using information provided, explain the objectives of the course and describe the minimum performance for each objective.

SUGGESTED INSTRUCTION TIME: 3 Hours

RECOMMENDATION:

- Course objectives, such as the Task Listing objectives, should be written and posted or distributed to students.

UNIT 1.0 B

INTRODUCTION TO SAFETY

UNIT 1.0 B INTRODUCTION TO SAFETY

TASK 1.01 GENERAL ORIENTATION

PERFORMANCE OBJECTIVE:

Given an orientation to building, shop, and fire safety; discuss, identify, or demonstrate general shop safety behavior and fire procedures.

PERFORMANCE ACTIONS:

1.0101 As applicable, discuss basic safety rules applicable to the training facility.

1.0102 Identify general shop safety rules.

1.0103 a. Review fire safety rules with the instructor.
b. Identify fire safety equipment, exits, and procedures in the shop and building area during a fire.

PERFORMANCE STANDARDS:

- Follow basic safety rules and established shop safety practices.
- Follows established fire safety practices and procedures.

SUGGESTED INSTRUCTION TIME: 1 Hour

UNIT 1.0 B INTRODUCTION TO SAFETY

TASK 1.02 IDENTIFY DESIRABLE VOCATIONAL TRAINING SAFETY HABITS

PERFORMANCE OBJECTIVE:

Given an introduction/orientation to general safety as well as to safety in the vocational education program or on the job; identify general occupational safety habits to the satisfaction of the instructor and meet all applicable safety rules and regulations.

PERFORMANCE ACTIONS:

1.0201 Listen to all information provided by the instructor or others concerning safety in the career center, vocational program and in live learning activities.

1.0202 Observe safety posters.

1.0203 Observe safety warning devices for hazardous materials or work areas.

1.0204 Demonstrate correct safety practices going to and from the classroom/shop as well as in the classroom situation.

1.0205 Describe the effect of safety on the production dollar, due to possible time loss.

1.0206 Observe learning situations or other situations for the observation of safe situations as well as violation of proper safety rules and regulations.

PERFORMANCE STANDARDS:

- To the standards of the instructor and standards applicable to the classroom or school or in the vocational field, demonstrate desirable occupational safety habits.
- "Zero" accidents.
- "Zero" safety violations.

SUGGESTED INSTRUCTION TIME: 1 Hour

UNIT 1.0 B INTRODUCTION TO SAFETY

TASK 1.03 OBSERVE CLASSROOM SAFETY PRACTICES

PERFORMANCE OBJECTIVE:

Given a typical vocational classroom/shop/lab or job situation, exhibit an awareness of safety practices, safe work habits, and a positive attitude concerning job safety and accident prevention and meet standards established by the instructor.

PERFORMANCE ACTIONS:

1.0301 Develop an awareness of vocational training/job hazards and become more safety conscious.

1.0302 Develop a serious attitude toward the daily use of safety procedures.

1.0303 Prepare for safety before entering the training work area.

1.0304 Prepare for safety at the work station.

1.0305 Prepare for safety on existing the training work area.

1.0306 Demonstrate knowledge of general safety color coding in the training/job facility and on equipment and tools.

1.0307 Practice safe procedures/habits daily.

PERFORMANCE STANDARDS:

- "Zero-level" accident record in vocational program.
- Instructor's standards based on recommended resources.
- Applicable OSHA Standards.

SUGGESTED INSTRUCTION TIME: 1 Hour

POSSIBLE RESOURCES:

Current vocational program safety guide publication of The School District of Greenville County.

Jacobs, Clinton O., and Howard J. Turner, Developing Shop Safety Skills, Athens, GA: American Association for Vocational Instructional Materials. (Approximately 80 pages of brief, visually clear suggestions concerning a variety of shop safety situations. Good student or resource manual.)

TASK 1.03 OBSERVE CLASSROOM SAFETY PRACTICES (Con't.)

RECOMMENDED RESOURCES:

Safety Handbook, A Guide for Trade and Industrial Programs, Clemson University, SC: Vocational Education Media Center, 1968. (No. 13/2/70, $2.25: Accompanying 31 Transparencies, No 9/8/68, $5.75.) Available from Trades and Industries Division Supervisor, Office of Vocational Education, South Carolina State Department of Education or from the Vocational Education Media Center, Clemson University, SC.

Planning for Emergencies, Occupational Safety and Health Short Course Number Seven, Columbia, SC: SC State Board for Technical and Comprehensive Education.

Notgrass, Troy, Safety Handbook for ICT, The University of Texas at Austin: Center for Occupational Curriculum Development, Division of Continuing Education, 1978.

Hoerner, Thomas A., and Mervin D. Bettis, Power Tool Safety and Operation, St. Paul, MI: Hobar Publications, 1977.

RELATED TECHNICAL INFORMATION:

- Regulations of individual center or vocational program.
- Regulations of The School District of Greenville County.
- Codes, laws, and ordinances.
- Materials and equipment handbooks and manuals.
- OSHA Regulations.
- E.P.A. Regulations.

TASK 1.04 APPLY FIRE SAFETY RULES AND PROCEDURES

PERFORMANCE OBJECTIVE:

Given examples of types of fires, fire extinguishers, and possible shop situations, apply fire safety rules and procedures. Meet National and local fire safety procedures.

PERFORMANCE ACTIONS:

1.0401 Identify and explain application for fire extinguishers of the following types:

- a. Form
- b. Carbon Dioxide
- c. Soda Acid
- d. Pump Tank
- e. Gas Cartridge
- f. Dry Chemical
- g. Multi-purpose Dry Chemical

1.0402 Describe procedures for operating selected fire extinguishers.

1.0403 Identify potential causes of fire in the vocational field/shop and common methods for avoiding or preventing fires.

1.0404 Inspect shop/laboratory for conformity with fire safety rules and procedures.

1.0405 Identify/explain relevant safety precautions applicable to vocational training activities.

PERFORMANCE STANDARDS:

- Apply applicable fire safety rules and procedures to the vocational program/training meeting all applicable standards, National and local, and meeting instructor's standards.

SUGGESTED INSTRUCTION TIME: 1 Hour

UNIT 1.0 B INTRODUCTION TO SAFETY

TASK 1.05 APPLY ELECTRICAL SAFETY RULES AND PROCEDURES

PERFORMANCE OBJECTIVE:

Given orientation to identifying electrical hazards, apply electrical safety rules and procedures. Electrical equipment with exposed wire, frayed cables, and deteriorated insulation must be reported and corrected. Proper grounding must be employed and maintained. Junction boxes, outlets, switches, breakers switches, and panels should be identified as to their use. Meet all applicable National and local standards and the standards of the instructor.

PERFORMANCE ACTIONS:

1.0501 Explain importance of labeling circuit breakers.

1.0502 Explain importance of proper grounding of machines or equipment of electrically operated hand tools.

1.0503 Demonstrate/explain methods for using flexible extention cords, long cables, or drop lights.

1.0504 Identify electrical hazards and explain safety rules pertaining the vocational field of training.

1.0505 Identify approved locations for all electrical equipment and power sources in the shop or at the training field location.

1.0506 Interpret safety precautions for electricity in the vocational shop.

PERFORMANCE STANDARDS:

- Apply electrical safety rules and procedures for the vocational shop/laboratory, including field training locations, on a day-to-day basis meeting all applicable National and local safety rules and regulations as well as the standards of the instructor.

SUGGESTED INSTRUCTION TIME: 1 Hour

(NOTE: Specific safety procedures and recommendations pertaining to a tool and equipment item may be included as a part of the task description concerning the tool/equipment.)

TASK 1.06 PERSONAL SAFETY

PERFORMANCE OBJECTIVE:

Given instruction, identify personal safety clothing, equipment, or procedures to ensure safety in the vocational field/training, with 100 percent accuracy, demonstrate proper use or safety behavior.

PERFORMANCE ACTIONS:

1.0601 List and explain personal safety rules/procedures.

1.0602 Identify appropriate protective clothing/equipment/etc., used in the vocational field/training, possibly from a given list, sketch, or mock-up.

PERFORMANCE STANDARDS:

- Given a list, sketch, or mock-up, identify with 100 percent accuracy personal safety clothing, equipment, etc., used in the vocational field.

SUGGESTED INSTRUCTION TIME: 1 Hour

RELATED TECHNICAL INFORMATION:

- Additional personal safety training will be integrated into occupational task training.

Addendum to Safety Unit

STUDENT'S SAFETY PLEDGE
AND
PARENT'S/GUARDIAN'S PERMISSION FOR OCCUPATIONAL TRAINING

________________________________, as part of vocational education training, will use/operate potentially hazardious occupational tools, machinery, equipment, and materials typical of the vocational field; provided that the student pledges to follow all safety rules and regulations of the instructor career center/The School District of Greenville County and provided that the student's parent or guardian grants permission for occupational training by signing the release below.

TO THE STUDENT:

The vocational student will be given proper instruction, both in the use of and correct safety procedures concerning occupational tools, machinery, equipment, and materials typical to the vocational field before being allowed to use/operate them.

The student must assume responsibility for following safe practices and rules, and therefore the student is asked to subscribe to the following safety pledge.

STUDENT'S SAFETY PLEDGE

1. "I (student) promise to follow all safety rules of the instructor/of the shop,
2. "I promise never to use a tool, machine, piece of equipment, or material of the vocational program without first having permission from the instructor.
3. "I will not ask permission to use a particular tool, machine, or piece of equipment unless I have been instructed in its use, and have made 100 percent on the safety test for that tool, machine or equipment.
4. "I will report any accident or injury to the vocational instructor immediately.
5. "I will report any potentially hazardious situation to the vocational instructor immediately."

Date __________ Student's Signature __________________________

PARENT'S/GUARDIAN'S PERMISSION

"I hereby give my consent to allow my son/daughter to use/operate all occupational tools, machines, equipment, and materials necessary in carrying out the requirements of the vocational program of training."

Date __________ Parent's/Guardian's Signature ________________

(Parents are cordially invited to visit the shop to inspect the occupational tools, machines, and equipment and to see them in operation.)

BEST COPY AVAILABLE

UNIT 1.0 C

INTRODUCTION TO LEADERSHIP/ JOB COMMUNICATIONS

UNIT 1.0 C INTRODUCTION TO LEADERSHIP

TASK 1.01 WORK COOPERATIVELY WITH FELLOW STUDENTS

PERFORMANCE OBJECTIVE:

Given instruction and an opportunity to meet fellow students in the vocational program environment, work cooperatively with fellow students as well as with other students in related vocational learning activities. Meet the instructor's standards and cooperate to the satisfaction of fellow students as a group.

PERFORMANCE ACTIONS:

1.0101 Participate in class and group learning activities.

1.0102 Encourage team work.

1.0103 Help plan student activities that promote cooperation.

PERFORMANCE STANDARDS:

- Work cooperatively with fellow students to the standards of the instructor and to the standards expected by fellow students as a group.

SUGGESTED INSTRUCTION TIME: N/A

UNIT 1.0 C — INTRODUCTION TO LEADERSHIP

TASK 1.02 — DEMONSTRATE DESIRABLE CHARACTERISTICS OF LEADERSHIP

PERFORMANCE OBJECTIVE:

Given an introduction/orientation to desirable qualities of a good leader, describe characteristics typical of a good leader, discuss desirable leadership qualities, and demonstrate an ability to follow as well as take a leadership position. Performance should be satisfactory to the instructor and fellow students.

PERFORMANCE ACTIONS:

1.0201 Define (process of) leadership and why it is desirable in a job situation.

1.0202 Describe (minimum of five)* positive characteristics desirable in a good leader (based on instruction).

1.0203 Identify (three) basic steps to becoming a good leader.

1.0204 Identify (five) benefits from developing good leadership qualities.

1.0205 Demonstrate leadership qualities by participating as a fellow or member of a group and, if required, participating as a group leader.

*Standards of instructor apply.

PERFORMANCE STANDARDS:

- Participate as a contributing member of a group, such as the vocational class or VICA, and demonstrate desirable leadership qualities as outlined by the vocational program instructor.

SUGGESTED INSTRUCTION TIME: N/A

RELATED TECHNICAL INFORMATION:

- VICA Objectives.
- State Department of Education, District, and instructor supplied materials.

(NOTE: A student self-rating checklist may be used in evaluation and evaluation may include ratings by other students as well as by the instructor.)

LEADERSHIP RATING SCALE

DIRECTIONS: Check the appropriate parenthesis to indicate your impression of the leadership characteristics being rated.

		Not Observed	Needs Improvement	Observed
1.	Exerts positive leadership.	( )	( )	( )
2.	Thoughful of feelings of others.	( )	( )	( )
3.	Enthusiasm is sincere and contagious.	( )	( )	( )
4.	Perserves until job is completed.	( )	( )	( )
5.	Cheerful disposition.	( )	( )	( )
6.	Gets along well with team members.	( )	( )	( )
7.	Gets along well with instructor/ supervisor.	( )	( )	( )
8.	Reacts constructively to criticism.	( )	( )	( )
9.	Punctual and gets job assignment done on time.	( )	( )	( )
10.	Free from prejudice.	( )	( )	( )
11.	Enjoys being a part of a group.	( )	( )	( )
12.	Reliable.	( )	( )	( )
13.	Adaptive to most situations.	( )	( )	( )
14.	Not easily discouraged.	( )	( )	( )
15.	Applies self to problems of job assignment.	( )	( )	( )
16.	Admits mistakes when made.	( )	( )	( )
17.	Tries to understand the other fellow's point of view.	( )	( )	( )
18.	Makes decisions quickly and accurately.	( )	( )	( )
19.	Seeks advise of others when appropriate.	( )	( )	( )
20.	Looks for opportunities to make improvements in job or work assignments.	( )	( )	( )

UNIT 1.0 C INTRODUCTION TO LEADERSHIP

TASK 1.03 (Optional) PARTICIPATE IN VICA CLUB ACTIVITIES*

PERFORMANCE OBJECTIVE:

Given an introduction/orientation to the Vocational Industrial Club of America (VICA)*, describe the general purposes of VICA, describe a typical VICA program at a vocational center, recall from memory the VICA motto, state the VICA pledge from memory, identify the symbols/symbolism in the VICA emblem, identify what the colors of the VICA organization represent. Performance should be acceptable to the VICA Club sponsor, instructor, and VICA Club members.

*Or a alternate, approved student organization.

PERFORMANCE ACTIONS:

1.0301 Join the VICA Club sponsored by the Career Center and vocational program.

1.0302 Participate actively as a member or an officer in the local VICA Club.

1.0303 Describe the purpose of VICA.

1.0304 Recall from memory the VICA motto.

1.0305 State the VICA pledge from memory.

1.0306 Name a minimum of five beliefs the VICA creed emphasizes.

PERFORMANCE STANDARDS:

- Demonstrate orally or in writing, from memory, accurate recall of the VICA motto, pledge, and at least five of the six beliefs of the VICA creed, and described the purpose of VICA to the satisfaction of the VICA sponsor or VICA Club officers and members as well as to the satisfaction of the vocational program instructor.

SUGGESTED INSTRUCTION TIME: N/A

RELATED TECHNICAL INFORMATION:

- VICA publication(s).
- VICA emblem.
- VICA motto, pledge, and creed.
- Local VICA Club in Career Center.

UNIT 1.0 C JOB COMMUNICATIONS

TASK 1.03 (Con't.) (Optional) DEMONSTRATE PROPER USE OF PARLIAMENTARY PROCEDURE

PERFORMANCE OBJECTIVE:

Given instruction, apply the principles of parliamentary procedure and describe the characteristics of a good chairman.

PERFORMANCE ACTIONS:

1. Identify two basic principles upon which parliamentary procedure is based.
2. List two important characterists of a "good" chairman.
3. Define or identify types of motions.
4. Describe/identify the order of business for a meeting conducted by parliamentary procedure.
5. Describe/identify the characteristics of the kinds of motions used in conducting a typical meeting by parliamentary procedure.
6. Demonstrate ability to use parliamentary procedure correctly.

PERFORMANCE STANDARDS:

- Define parliamentary procedure and how it is used to contribute to a meeting, identify the charactistics of a good chairman, and used parliamentary procedures correctly meeting the standards of the instructor.

SUGGESTED INSTRUCTION TIME: N/A

(NOTE: "This activity should be integrated into VICA activities and objectives.")

RELATED TECHNICAL INFORMATION:

- Robert's Rules of Order.
- VICA Club.
- Public Speaking.

TASK 1.03 (Con't.) (Optional) COMMUNICATE A MESSAGE BY THE MEDIUM OF A SPEECH

PERFORMANCE OBJECTIVE:

Given instruction, list purposes of a speech, characteristics of a speech, and write and orally deliver a speech. The delivered speech should contain accurate information, be technically correct in organization and delivery, and the intended message should be communicated.

PERFORMANCE ACTIONS:

1. Identify three purposes for making a speech.
2. Write an outline for a proposed speech.
3. List at least five methods/ways to make a speech effective/interesting.
4. Deliver a three to five minute speech that successfully communicates the intended message.

PERFORMANCE STANDARDS:

- Successfully communicate intended message by a speech using proper techniques and meeting instructor's (or VICA sponsor's) standards.

ALTERNATE STANDARD:

- Student is to describe verbally, task being performed, techniques used, etc., to the instructor's standards.

SUGGESTED INSTRUCTION TIME: N/A

(NOTE: "This activity may be integrated into VICA activities and objectives.")

RELATED TECHNICAL INFORMATION:

- VICA Club.
- Communications.

UNIT 1.0 D

PREPARING FOR WORK

TASK 1.01

DESCRIBE THE FREE ENTERPRISE SYSTEM AND THE DIFFERENCE BETWEEN LABOR AND MANAGEMENT

PERFORMANCE OBJECTIVE:

Given an introduction/orientation to the free enterprise system of economics, describe to the satisfaction of the instructor the free enterprise system of economics as found in the United States and describe the relationship between labor and management.

PERFORMANCE ACTIONS:

1.0101 Read assignments in trade magazines or periodicals.

1.0102 Listen to talks by representatives of labor and management.

1.0103 Discuss the Free Enterprise System as represented by business/industry in the United States.

1.0104 Discuss problems concerning employee-management-trade union transactions.

PERFORMANCE STANDARDS:

- To the satisfaction of the instructor describe the Free Enterprise System of economics as represented by business/industry in the United States.

SUGGESTED INSTRUCTION TIME: N/A

RELATED TECHNICAL INFORMATION:

- Free Enterprise System of Economics.
- Management and Labor Relationships.

UNIT 1.0 D PREPARING FOR WORK

TASK 1.02 INTERPRET LABOR LAWS AND REGULATIONS

PERFORMANCE OBJECTIVE:

Given instruction, necessary references concerning labor laws and regulations, interpret typical labor laws and regulations. Performance must meet the instructor's standards.

PERFORMANCE ACTIONS:

1.0201	Identify and interpret the "Fair Labor Standards Act."
1.0202	State the minimum wage for a worker.
1.0203	State the typical minimum age for a worker.
1.0204	Identify how to report earned income.
1.0205	Define overtime.
1.0206	Identify local or State laws that affect the worker.

PERFORMANCE STANDARDS:

- Interpret typical labor laws and regulations of the Federal, State, and local level that affect the worker.
- The instructor's standards must be met.

SUGGESTED INSTRUCTION TIME: 1/2 Hour

UNIT 1.0 D PREPARING FOR WORK

TASK 1.03 INTERPRET PAYROLL DEDUCTIONS FOR TAXES, ETC.

PERFORMANCE OBJECTIVE:

Given instruction and sample forms concerning income tax and other withholdings, interpret the typical forms used in income tax and other withholdings to the satisfaction of the instructor and itemize typical payroll deductions that worker encounters. Performance must be to the instructor's standards.

PERFORMANCE ACTIONS:

1.0301 Obtain a social security card (if not acquired already). /Recommended/

1.0302 Identify the purposes of social security withholdings from pay.

1.0303 Describe who is qualified for unemployment compensation.

1.0304 Describe who qualifies for workmen's compensation.

1.0305 Complete typical forms used for Federal Income Tax Withholdings.

1.0306 Interpret a typical Federal Income Tax Wage and Tax Statement form.

1.0307 Identify typical payroll deductions.

PERFORMANCE STANDARDS:

- Given typical forms used for payroll deduction and reporting of income and other taxes, interpret payroll deductions and other statements on the forms.
- Performance must be to the instructor's standards.

SUGGESTED INSTRUCTION TIME: 1/2 Hour

TASK 1.04 IDENTIFY TYPICAL CAREER OPPORTUNITIES

PERFORMANCE OBJECTIVE:

Given instruction, data on the local business and industry, opportunities to study entry-level job opportunities; identify the major catagories of potential employers in the local community (and the key characteristics of each).

PERFORMANCE ACTIONS:

"Performance actions may vary from career center to career center due to the potential employers served and based on the emphasis of the individual vocational program."

PERFORMANCE STANDARDS:

- Identify typical types of entry-level jobs, in the local community, and the major characteristics that distinguish them based on given instruction, local market data, and student observation.
- Meet instructor's standards.

SUGGESTED INSTRUCTION TIME: 1 Hour

UNIT 1.0 D PREPARING FOR WORK

TASK 1.05 LOCATE JOB OPPORTUNITIES

PERFORMANCE OBJECTIVE:

Given job placement information such as newspaper ads and personal contacts, list a minimum of ten specific jobs in the community. One week will be allowed to complete the task.

PERFORMANCE ACTIONS:

1.0501 Identify job opportunity areas as related to training, skills, and interests.

1.0502 Contact (or list) various employment opportunity sources:

a. Job placement office.
b. Want ads.
c. Employment Security.
d. Other sources such as family, friends, school officials, etc.

1.0503 Estimate competition for job opportunities (number of other persons wanting same job) and target enough job opportunities to statistically qualify for one opportunity.

PERFORMANCE STANDARDS:

- Student must list a minimum of ten specific jobs in the community as advertised in the newspaper or media or through personal contacts.
- The jobs must be available currently.

SUGGESTED INSTRUCTION TIME: 2 Hours (Skill development and performance to be demonstrated over one week.)

UNIT 1.0 D PREPARING FOR WORK

TASK 1.06 (Optional) PREPARE RESUME

PERFORMANCE OBJECTIVE:

Given examples of suitable resume/personal data sheets, prepare and type (or print at a minimum) a personal resume on paper acceptable to the instructor with all errors acceptable corrected.

PERFORMANCE ACTIONS:

1.0601 Define the basic purpose of the resume.

1.0602 Outline the essential information a resume of personal data sheet should contain:

a. Personal data such as name, address, telephone, age, physical descriptions, marital status, etc.
b. Job objective or skills offered.
c. Training.
d. Experience.
e. Accomplishments, interests, etc.
f. References.

1.0603 Prepare a resume that is acceptable to the instructor.

PERFORMANCE STANDARDS:

- Prepare resume/personal data sheets on paper and in a form acceptable to the instructor with all errors acceptable corrected.

SUGGESTED INSTRUCTION TIME: 2 Hours (Optional)

RELATED TECHNICAL INFORMATION:

- Job Seeking - How and Where, Columbia, SC: South Carolina State Department of Education, 1981.

TASK 1.07 COMPOSE APPLICATION LETTER

PERFORMANCE OBJECTIVE:

Given a newspaper ad for a job, compose a letter of application. The letter must be mailable and must include all necessary personal information.

PERFORMANCE ACTIONS:

1.0701 Assemble necessary information, supplies, and equipment.

1.0702 Compose a letter of application for a given business position. Include the necessary information.

1.0703 Proofread the letter, correcting all errors.

PERFORMANCE STANDARDS:

- Compose a letter of application for a position advertised in the local newspaper and suitable for the skills and experience of the student or for the hypothetical position described by the instructor.
- Include necessary personal information and prepare the letter in mailable form.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Job Seeking - How and Where, Columbia, SC: South Carolina State Department of Education, 1981.

UNIT 1.0 D PREPARING FOR WORK

TASK 1.08 COMPLETE A TYPICAL EMPLOYMENT APPLICATION FORM

PERFORMANCE OBJECTIVE:

Given an employment application form typical of the job, complete the form with all information accurate, neatly typed or printed in, and aligned in the form blanks.

PERFORMANCE ACTIONS:

1.0801 Assemble minimum necessary information:

a. Personal information such as name, address, and date of birth.
b. Data related to applicant such as social security number, etc.
c. Schooling or training information.
d. Past employment record.
e. References.

1.0802 Complete the application form following directions carefully with neat, aligned entries.

1.0803 Proofread the completed form for errors or incomplete blanks.

PERFORMANCE STANDARDS:

- Complete an employment application form typical of the job with all information accurate, neatly printed or typed in and aligned in the form blanks to the instructor's standards.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Job Seeking - How and Where, Columbia, SC: South Carolina State Department of Education, 1981.

TASK 1.09 INTERVIEW FOR A JOB

PERFORMANCE OBJECTIVE:

Given instruction on how to interview for a job, a job interview checklist, and a mock job interview; complete a job interview to the satisfaction of the instructor.

PERFORMANCE ACTIONS:

1.0901 Prepare for the interview:

   a. Prepare personal appearance.
   b. Prepare necessary information, references, or other material for the interview.

1.0902 Arrive at the appropriate time and identify yourself and your purpose or appointment.

1.0903 Give a good impression in meeting the interviewer.

1.0904 Exchange essential information with the interviewer to reflect your job skills, training, and experience as well as your personality. In addition, learn about the job opportunity and employer.

PERFORMANCE STANDARDS:

- Complete a mock job interview to the satisfaction of the instructor following suggested procedures.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 1.0 D PREPARING FOR WORK

TASK 1.10 COMPOSE FOLLOW-UP LETTER

PERFORMANCE OBJECTIVE:

Given a case situation by the instructor or from the textbook, compose and write a follow-up letter appropriate to the job application or interview situation and in mailable form. The finished letter must meet the instructor's standards.

PERFORMANCE ACTIONS:

1.1001	Assemble necessary information, supplies, and equipment.
1.1002	Compose a follow-up letter, in mailable form, to a given job application or interview situation.
1.1003	Proofread the letter, correcting all errors.

PERFORMANCE STANDARDS:

- Compose and write a follow-up letter appropriate in the judgement of the instructor to a given job application or interview situation and in mailable form.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Job Seeking - How and Where, Columbia, SC: South Carolina State Department of Education, 1981.

UNIT 1.0 D PREPARING FOR WORK

TASK 1.11 IDENTIFY POST-SECONDARY CAREER DEVELOPMENT OPPORTUNITIES

PERFORMANCE OBJECTIVE:

Given an orientation to similar post-secondary career development programs, such as offered at Greenville Technical College, a report of skill competencies developed during secondary training, and other information as needed; identify post-secondary career development opportunities.

PERFORMANCE ACTIONS:

1.1101 Identify:

a. Need for additional training at the post-secondary level.
b. Benefits from additional training.

1.1102 a. Identify post-secondary training programs available at GTC.
b. Identify how post-secondary (GTC) training differs from secondary training in related areas.

1.1103 Visit GTC program of possible interest. Talk with instructor, department head, or addmissions counselor at GTC.

1.1104 Determine, with secondary and post-secondary personnel assistance, if exemption of post-secondary level training is recommended.

1.1105 Accomplish the required steps to apply or test for exemptions (if applicable).

PERFORMANCE STANDARDS:

- Identify post-secondary training opportunities, specifically at GTC, to include: Associate Degree or Diploma in areas of possible career interest.

SUGGESTED INSTRUCTION TIME: 6 Hours (Approximately)

UNIT 1.0 E

INTRODUCTION TO DESIRABLE JOB/LEARNING CHARACTERISTICS/HABITS/ATTITUDES

UNIT 1.0 E — INTRODUCTION TO DESIRABLE JOB/LEARNING CHARACTERISTICS/ HABITS/ATTITUDES

TASK 1.01 — DESCRIBE GOOD WORK HABITS IMPORTANT TO JOB SUCCESS

PERFORMANCE OBJECTIVE:

Given introduction/orientation to desirable work habits, as described by potential employers or tradesmen, demonstrate desirable (good) work habits (based on information provided by the instructor) that represent typical standards expected by business/industry (potential employers) for entry employment success.

PERFORMANCE ACTIONS:

1.0101 Identify specific criteria for success in typical entry level job categories.

1.0102 Participate in planning student's learning activities.

1.0103 Maintain a clean, well-organized learning situation (desk, locker, work area, shop, etc.) which is conducive to effective learning.

1.0104 Objectively receive instructor or other critique (correction, criticism, suggestions, etc.) of learning or job performance (behavior) or product or activity.

1.0105 Describe good work habits and how they are related to job success, stability, and advancement.

PERFORMANCE STANDARDS:

- Describe to the instructor's standards good work habits that are important to job success, stability, and advancement.

SUGGESTED INSTRUCTION TIME: N/A

UNIT 1.0 E	INTRODUCTION TO DESIRABLE JOB/LEARNING CHARACTERISTICS/ HABITS/ATTITUDES
TASK 1.02	EXHIBIT SUCCESSFUL JOB PERFORMANCE CHARACTERISTICS

PERFORMANCE OBJECTIVE:

Given instruction, demonstrate job performance characteristics that are considered important to entry-level career success in the vocational field. A "Job Performance Rating Sheet" will be used to evaluate performance and all items must be rated "frequently" or above.

(NOTE: It is recommended in research findings that employer-recommended "job performance characteristics" and "work attitudes" be included as part of the vocational student's overall training and that demonstrated performance in these areas be included in the total evaluation of the student.)

PERFORMANCE ACTIONS:

1.0201 Review important work characteristics for the vocational field.

1.0202 Review the "Job Performance Rating Sheet" with the instructor.

1.0203 Demonstrate those work characteristics that are considered important to success in the vocational field.

PERFORMANCE STANDARDS:

- Demonstrate by personal performance the work characteristics that are considered important.
- A "Rating Sheet" will be used to evaluate performance and all items must be rated "frequently" (observed) or above.

SUGGESTED INSTRUCTION TIME: 3 Hours

ACCOMPANIED BY ADDENDUM PAGE (Rating Sheet)

Rating sheet includes the following categories:

- Accuracy of work
- Care of working space
- Care of equipment

Rating sheet (Con't.):

- Speed
- Use of working time
- Initiative
- Attendance
- Attitude toward fellow workers
- Attitude toward teacher
- Observance of safety rules
- Use of materials
- Responsibility
- Accident report
- Personal appearance, cleanliness

Addendum to Task 1.02 E

JOB PERFORMANCE RATING SHEET

Student ______________________ Job Performed ______________

Dates from ______________________ to ______________________

Place of work ________________ Supervisor ________________

DIRECTIONS: Circle the number that best fits your opinion of the student's performance using the following factors:

		Never	Seldom	Frequently	Usually	Always
1.	Gets to work on time	1	2	3	4	5
2.	Uses time properly	1	2	3	4	5
3.	Shows interest in work	1	2	3	4	5
4.	Shows dependability	1	2	3	4	5
5.	Is ambitious	1	2	3	4	5
6.	Is neat (work and self)	1	2	3	4	5
7.	Works well with others	1	2	3	4	5
8.	Follows directions	1	2	3	4	5
9.	Works without supervision	1	2	3	4	5
10.	Shows good manners	1	2	3	4	5
11.	Meets people well	1	2	3	4	5
12.	Uses knowledge on the job	1	2	3	4	5
13.	Seeks assistance, when necessary	1	2	3	4	5

Does the worker have the skills for doing satisfactory work?
Yes __ No __

List the skills or characteristics that need to be developed or improved upon:

Additional comments:

Date ________________ Supervisor ________________________

UNIT 1.0 E

INTRODUCTION TO DESIRABLE
JOB/LEARNING CHARACTERISTICS/
HABITS/ATTITUDES

TASK 1.03

EXHIBIT DESIRABLE WORK ATTITUDES

PERFORMANCE OBJECTIVE:

Given instruction, demonstrate work attitudes that the majority of potential employers prefer in an entry level worker. Performance will be evaluated on a "Work Attitudes Score Card" and a minimum of 90 percent should be attained. Performance will be rated throughout training and should improve to 100 percent by the end of the training period.*

PERFORMANCE ACTIONS:

1.0301 Review work attitudes considered important to success in the vocational field.

1.0302 Review the "Work Attitudes Score Card."

1.0303 Demonstrate the type of work attitudes that potential employers in the local industry report as important to job success.

PERFORMANCE STANDARDS:

- Demonstrate to 90 percent acceptable rating on a "Work Attitudes Score Card" to be completed by the instructor those work attitudes considered important by local potential employers for entry-level job success.

SUGGESTED INSTRUCTION TIME: 3 Hours

ACCOMPANIED BY ADDENDUM PAGE (Work Attitudes Score Card)

(*NOTE: It is recommended in research study findings that employer-recommended "job performance characteristics" and "work attitudes" be included as part of the vocational student's overall training and that demonstrated performance in these areas be included in the total evaluation of the student.)

Addendum to Task 1.03 E

WORK ATTITUDES SCORE SHEET

DIRECTIONS: Score the student on the following attitudes and work behavior by circling the appropriate description either "yes" (+) or "no" (-). Indicate any comments to support the rating or recommendations.

	Circle		Comments/ Recommendations
	(No)	(Yes)	
Cooperative	-	+	
Courteous	-	+	
Loyal to program study and job team members	-	+	
Tackful	-	+	
Self Disciplined	-	+	
Respectful	-	+	
Alert	-	+	
Motivated	-	+	
Responsible	-	+	
Trustworthy	-	+	
Dependable	-	+	
Cheerful	-	+	
Polite	-	+	
Interest	-	+	
Friendly	-	+	
Sympathetic (sensitive) to fellow students	-	+	
Accepts changes	-	+	
Follows rules and regulations	-	+	
Does share of work	-	+	
Helps others, if needed	-	+	
Works regularly	-	+	
On time	-	+	
Shows pride in work	-	+	
Keeps promises	-	+	
Does not waste time	-	+	
Controls anger	-	+	
Accepts criticism	-	+	
Follows superior's directions	-	+	

28 Items total TOTAL (+'s) ________

INTERPRETATION

28 = 100% = Level 4
25 = 90% = Level 3
22 = 80% = Level 2
20 = 70% = Level 1
17 = 60% = Level 0

Student: ______________________________

UNIT 1.0 E

INTRODUCTION TO DESIRABLE JOB/LEARNING CHARACTERISTICS/ HABITS/ATTITUDES

TASK 1.04

DEMONSTRATE RESPECT FOR AND CARE OF SCHOOL PROPERTY

PERFORMANCE OBJECTIVE:

Given a classroom, shop, or other instructional setting with access to furniture, equipment, tools and materials, and given proper instruction; demonstrate a respect for and care of public property (training facilities) and instructional materials to the standards established by The School District of Greenville County, the career center, and the instructor.

PERFORMANCE ACTIONS:

1.0401 Listen to information provided by the instructor and read given or posted materials concerning student behavior and care of property.

1.0402 Demonstrate respect for and care of public school property including:

a. Facilities (building, classroom).
b. Furnishing (furniture).
c. Equipment and tools.
d. Instructural materials.

PERFORMANCE STANDARDS:

- Demonstrate respect for and care of school property as represented by the classroom, shop, equipment, tools and materials used in instruction.
- Performance must be to the standards of policies of the School District, the career center, and the instructor.

(NOTE: A willful disregard or disrespect (intentional damage or destruction) of instructional facilities, equipment, or materials should be considered a most serious situation since an employer typically would require payment for intended damages and might fire the employee or bring legal charges against the employee for intentional damage to facilities, equipment, or materials.)

SUGGESTED INSTRUCTION TIME: N/A Integrated during two-year training period.

UNIT 1.0 F

BASIC MATH SKILLS

TASK 1.01 BASIC MATH - FRACTIONS

PERFORMANCE OBJECTIVE:

Given a pretest or examples by the instructor, conduct the following operations with fractions:

1. Change any fraction to a decimal number, and any terminating decimal number to a fraction.
2. Arrange in order...unit and simple nonunit fractions.
3. Write equivalent fractions in higher, lower, and lowest terms.
4. Write improper fractions as whole or mixed numbers, and mixed numbers as improper fractions.
5. Multiply fractions and mixed numbers, expressing answers in simplest form.
6. Divide fractions and mixed numbers, expressing answers in simplest form.
7. Add and subtract unlike fractions, expressing answers in simplest form.
8. Add and subtract mixed numbers with unlike fractions, expressing answers in simplest form.
9. Use rational numbers to solve simple work problems.

PERFORMANCE ACTIONS:

Consult: Curriculum Guide for High School General Mathematics, Greenville, SC: The School District of Greenville County, 1979.

PERFORMANCE STANDARDS:

- Student should be able to complete pretest in Math Curriculum Guide with 90 percent accuracy.
- Consult the Math Curriculum Guide for pretests, suggested exercises, and references.

(NOTE: The level of this math skill is eighth grade, General Math I.)

SUGGESTED INSTRUCTION TIME: Hours (Actual hours of instruction will be determined by student's math skill as indicated by pretest. Remedial instruction may be at initiation of skill development if required.)

UNIT 1.0 F BASIC MATH SKILLS

TASK 1.02 BASIC MATH - DECIMALS

PERFORMANCE OBJECTIVE:

Given a pretest or examples by the instructor, conduct the following decimal math operations:

1. Name the place value of digits in decimal numbers of up to nine digits before the decimal and six digits after the decimal.
2. Compare decimal numbers and arrange them in order.
3. Write the numeral for any decimal number of up to four decimal places.
4. Round decimal numbers to any designated place value up to thousandths.
5. Add and subtract decimal numbers of up to six digits.
6. Multiply decimal numbers by whole numbers or decimal numbers.
7. Divide a number by a three-digit decimal number.
8. Multiply and divide decimal numbers by powers of ten, by inspection.

PERFORMANCE ACTIONS:

Consult: Curriculum Guide for High School General Mathematics, Greenville, SC: The School District of Greenville County, 1979.

PERFORMANCE STANDARDS:

- Student should be able to complete pretest in Math Curriculum Guide with 90 percent accuracy.
- Consult: Curriculum Guide for High School General Mathematics, 1979, for pretests, suggested exercises, and references.

SUGGESTED INSTRUCTION TIME: ** (Combined training)

(NOTE: The level of this math skill is eighth grade, General Math I.)

UNIT 1.0 F BASIC MATH SKILLS

TASK 1.03 (Optional) BASIC MATH - VOLUMES

PERFORMANCE OBJECTIVE:

Given a pretest or examples by the instructor, find the volume of any rectangular prism or cube.

PERFORMANCE ACTIONS:

Consult: Curriculum Guide for High School General Mathematics, Greenville, SC: The School District of Greenville County, 1979.

PERFORMANCE STANDARDS:

- Student should be able to complete pretest in Math Curriculum Guide with 90 percent accuracy.
- Consult: Curriculum Guide for High School General Mathematics for pretests, suggested exercises, and references.

SUGGESTED INSTRUCTION TIME: ** (Combined training)

(NOTE: The level of this math skill is eighth grade, General Math I.)

TASK 1.04 (Optional) BASIC MATH - AREAS

PERFORMANCE OBJECTIVE:

Given a pretest or examples by the instructor, find the area of the following types of figures:

a. Rectangle and square
b. Circle

PERFORMANCE ACTIONS:

Consult: Curriculum Guide for High School General Mathematics, Greenville, SC: The School District of Greenville County, 1979.

PERFORMANCE STANDARDS:

- Student should be able to complete pretest in Math Curriculum Guide with 90 percent accuracy.
- Consult the Math Curriculum Guide for pretests, suggested exercises, and references.

SUGGESTED INSTRUCTION TIME: ** (Combined training)

(NOTE: The level of this math skill is eighth grade, General Math I.)

UNIT 1.0 F BASIC MATH SKILLS

TASK 1.05 (Optional) THE METRIC SYSTEM

PERFORMANCE OBJECTIVE:

Given basic instruction in the metric system and conversion from United States Customary units to metric; read and convert specifications and dimensions from one system into the other system on teacher or text assigned problems with 100 percent accuracy.

PERFORMANCE ACTIONS:

1.0501 Demonstrate ability to read and use U.S. Customary length measurements.

1.0502 Identify basic SI units and symbols.

Unit	Name	Symbol
Length	Meter	m

1.0503 Identify basic Metric prefixes:

Prefix	Amount	Fraction	Decimal
Milli	One-thousandth	1/1000	0.001
Centi	One-hundredth	1/100	0.01
Deci	One-tenth	1/10	0.1

1.0504 Inches x 25.4 = Millimeters.

1.0505 Millimeters x 0.0394 = Inches.

PERFORMANCE STANDARDS:

- Accuracy of 100 percent using metric measurements.

SUGGESTED INSTRUCTION TIME: ** (Combined training)

RELATED TECHNICAL INFORMATION:

- ANSI Standards.
- System International d'United (SI) ((Metric System)).
- U.S. Customary Measurements System.

UNIT 1.0 G

BASIC MEASURING

UNIT 1.0 G BASIC MEASURING

TASK 1.01 MEASURING

PERFORMANCE OBJECTIVE:

Given proper instruction, read a rule and use other measuring tools with the precision necessary to take measurements or set them up.

PERFORMANCE ACTIONS:

1.0101 Define measuring terms with 80 percent accuracy.

1.0102 Accurately identify basic tools used in measuring.

1.0103 Read a rule to the nearest feet, inches, and fractions of inches down to 1/16 inch.

1.0104 Demonstrate ability to perform following measuring skills:

a. Measure objects to nearest sixteenth of an inch when given pictures of objects and a measuring instrument.
b. Draw lines and objects to specified dimensions.

PERFORMANCE STANDARDS:

- Demonstrate ability to measure to 1/16 inch and draw lines or objects to specified dimensions (1/16 inch accuracy).

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Graduations on rule: Halves, quarters, eighths, sixteenths.
- Rules: Tapes (steel or other), folding rule, straight rule, steel square.
- Metric measurement.

EXPANSION OF TASK:

- Estimate a measurement to 1/32 inch.
- Measure using the metric system.

DEFINITIONS

MEASURING	Setting of limits or bounds according to a pre-determined standard.
INCH	Smallest whole unit of lineal measure typically used.
FOOT	Unit of measure consisting of twelve equal parts called inches.
FRACTION	One or more equal parts of a whole. (i.e., 1/2 inch, 1/4 inch, 3/8 inch, and 5/16 inch)
RULE	Instrument graduated in whole units and fractions of units and used in measuring.
DIMENSION	Number of full units and fraction of units between two points.

Module 1.0

STUDENT: ______________________________ DATE: ____________

1. Which one of the following is a personal safety item?

____ a. fire extinguisher
b. shop exhaust fans
c. safety glasses
d. jack stands

2. Shop safety is the responsibility of ____.

____ a. the owner
b. the manager
c. everyone
d. the mechanic

3. When working under a car that is jacked up you should always use ____.

____ a. a bumper jack
b. jack stands
c. creepers
d. hydraulic jacks

4. One of the greatest hazards in a body shop is ____.

____ a. the acetylene torch
b. compressed air
c. paint thinner
d. fire

5. When using the acetylene torch, stay away from ____.

____ a. compressed air
b. water
c. oxygen
d. grease or oil

6. A compressed air hose must never be ____.

____ a. used in an automotive shop
b. pointed at someone else
c. left pressurized overnight
d. kept on a reel

7. Safety goggles should be worn ____.

____ a. when doing any job that would endanger your eyes
b. when you are told to wear them by your instructor
c. only if you do not wear glasses
d. while welding

8. What is the most common cause of accidents in the auto body shop?

____ a. failure to follow instructions
b. following instructions
c. following wrong instructions
d. using wrong tools for job

COMPLETION QUESTIONS ON THE PORTABLE GRINDER:

1. A cracked grinding wheel will not have a __________ sound when struck lightly with a hard object.

2. It is recommended to run the grinder at full speed for about __________ minute(s) after mounting a grinding wheel.

3. Do not lay the grinder down until the __________ has stopped turning.

4. The __________ side of the large washers should be next to the grinding wheel.

5. Be sure the __________ guard is in place when using the portable grinder.

COMPLETION QUESTIONS FOR THE PORTABLE DRILL:

1. When drilling deep holes, withdraw the twist drill several times to clear the __________.

2. Check to see if the __________ has been removed from the chuck before starting the drill.

3. Be sure the switch is __________ before connecting the drill to the power source.

4. Make sure the drill is grounded properly to the power outlet or is __________ __________.

5. What is the most important piece of safety equipment that should be worn when using the power drill? __________

MODULE 2.0

INTRODUCTION TO AUTO BODY REPAIR

AUTO BODY
INTRODUCTION TO AUTO BODY REPAIR
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 2.0	INTRODUCTION TO AUTO BODY REPAIR	
2.01	Identify and Use Automotive Fasteners	4
2.02	Shop Practices and Procedures	2
	TOTAL	6

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
MODULE 2.0	INTRODUCTION TO AUTO BODY REPAIR
2.01	(Identify and Use Automotive Fasteners) Given proper instruction, various fasteners used in auto body repair, and job situations requiring the use of fasteners; select, and identify, by proper terminology, the appropriate fasteners for the job and use the fastener properly, meeting manufacturer's specifications and instructor's standards.
2.02	(Shop Practices and Procedures) Given proper instruction concerning standard shop operating procedures, appropriate reference materials, and simulated or typical job situations; choose and use related technical information, such as shop manual, flat rate manual, manufacturer's specifications, and parts catalogs, using the proper terminology and parts requisition forms. Performance must be to instructor's standards.

MODULE 2.0	INTRODUCTION TO AUTO BODY REPAIR
TASK 2.01	IDENTIFY AND USE AUTOMOTIVE FASTENERS

PERFORMANCE OBJECTIVE:

Given proper instruction, various fasteners used in auto body repair, and job situations requiring the use of fasteners; select, and identify, by proper terminology, the appropriate fasteners for the job and use the fastener properly, meeting manufacturer's specifications and instructor's standards.

(NOTE: Orientation task: Competency will be developed during entire training period.)

PERFORMANCE ACTIONS:

2.0101 Identify:

- screws
- bolts
- nuts
- lock washers
- cotterpins
- snap rings
- keys and splines

2.0102 Determine proper fasteners for given situations.

2.0103 Correctly use various types of fasteners.

PERFORMANCE STANDARDS:

- Use auto body fasteners correctly in given job situations.

SUGGESTED INSTRUCTION TIME: 4 Hours

RELATED TECHNICAL INFORMATION:

- Textbooks.
- Manufacturer's catalogs.
- Specification manuals.
- Metric fasteners.
- Recognize English thread designation system.
- Distinguish between fasteners of different quality with the grade between fasteners of different quality with the grade marking system.

Addendum to Task 2.01

"Describing all of the different types of auto body fasteners used by manufacturers would be very difficult. Some additional examples are:

- Attaching screws
- Bolt and clip assembly (T-bolt)
- Integral studs with attaching nuts
- Bath-tub type snap-on clip
- Slide-loading snap-on clips
- "W" base snap-on clips
- Weld-on studs and clips
- Snap-in studs
- Pinchweld molding attaching clips

Other examples that the instructor may require the student to recognize are:

MODULE 2.0 INTRODUCTION TO AUTO BODY REPAIR

TASK 2.02 SHOP PRACTICES AND PROCEDURES

PERFORMANCE OBJECTIVE:

Given proper instruction concerning standard shop operating procedures, appropriate reference materials, and simulated or typical job situations; choose and use related technical information, such as shop manual, flat rate manual, manufacturer's specifications, and parts catalogs, using the proper terminology and parts requisition forms. Performance must be to instructor's standards.

PERFORMANCE ACTIONS:

2.0201 Identify and state purpose of shop operating procedures.

2.0202 Use shop operating reference materials: (as applicable)

a. Shop operating manuals.
b. Charts.
c. Forms and job orders.
d. Flat rate manual.
e. Manufacturer's specifications.
f. Parts manual.

2.0203 Demonstrate proper use of common shop terminology.

PERFORMANCE STANDARDS:

- In given shop situation, choose and use most appropriate shop manuals for reference as well as other references and shop operating procedure guides meeting the instructor's standards.

SUGGESTED INSTRUCTION TIME: 2 Hours

RELATED TECHNICAL INFORMATION:

- Locate vehicle "Identification Tag/Plate."

Module 2.0

STUDENT: ______________________________ DATE: __________

PERFORMANCE TESTS:

1. From instructor provided illustrations or actual parts, identify automotive fasteners such as bolts, nuts, washers, cotter pins, snap rings, tapping screws, and other devices used to connect automotive parts and trim. Accuracy must be to the instructor's standards using acceptable terminology.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

2. Choose and correctly use shop manuals and other reference publications provided by the instructor to demonstrate proper understanding of trade terminology and to correctly locate information desired. Performance must meet the instructor's standards.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

TRUE/FALSE:

1. ___ A bolt is used in a threaded hole.

2. ___ A stud is a fastener with threads at both ends.

3. ___ A cotter pin is used with a castellated nut.

4. ___ Metric and English fasteners usually may be interchanged.

5. ___ The strength of a fastener is given as a grade marking or number.

IDENTIFY:

The drawing below contains various fasteners used in automotive service work. Match the fasteners circled with the appropriate terminology by placing the number next to the terminology in the blank next to the letters.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

j. _____

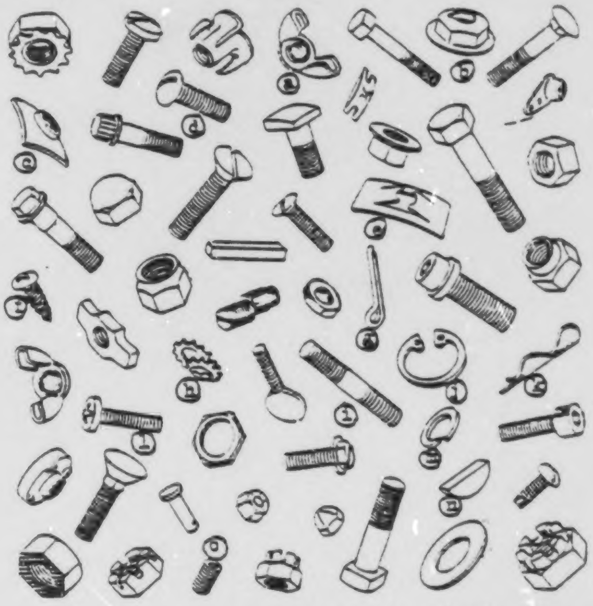
k. _____

l. _____

m. _____

n. _____

o. _____



1–Flange-lock nut. 2–Fillister head machine screw. 3–Barrel prong nut. 4–Wing nut. 5–Cap screw. 6–Pal nut. 7–Carriage bolt. 8–Spring nut. 9–12-point head bolt. 10–Round head machine screw. 11–Askew-head bolt. 12–Single thread nut. 13–Flanged nut. 14–Cap screw. 15–Anchor nut. 16–Plain hex nut. 17–Hex flange screw. 18–Acorn (cap) nut. 19–Flat head screw. 20–Small flat head screw. 21–Speed nut. 22–Sheet metal screw. 23–Locking nut. 24–Key. 25–Offset (eccentric) stud. 26–Thin nut. 27–Cotter pin. 28–Socket head bolt. 29–Locking nut. 30–Wing nut. 31–Specialty nut. 32–Toothed lock washers. 33–Thumbscrew. 34–Stud. 35–Snap ring. 36–Spring lock pin. 37–Cross head machine screw. 38–Panel nut. 39–Flanged hex slotted head screw. 40–Split lock washer. 41–Hex socket head bolt. 42–Welded nut. 43–Plow bolt. 44–Clevis pin. 45–Open top acorn nut. 46–Closed top acorn nut. 47–Square head cap screw. 48–Woodruff key. 49–Self-tapping screw. 50–Serrated nut. 51–Slotted nut. 52–Set screw. 53–Castle nut. 54–Flat washer. 55–Castle nut.

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MODULE 3.0

INTRODUCTION TO BODY AND FRAME CONSTRUCTION

AUTO BODY
INTRODUCTION TO BODY AND FRAME CONSTRUCTION
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 3.0	INTRODUCTION TO BODY AND FRAME CONSTRUCTION	
3.01	Identify Parts of Typical Auto Body Construction	12
3.02	Identify Typical Auto Frame Construction and Explain Importance of Frame Alignment	3
	TOTAL	15

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 3.0	INTRODUCTION TO BODY AND FRAME CONSTRUCTION
3.01	(Identify Parts of Typical Auto Body Construction) Given diagrams of different auto body parts and construction, identify by proper name the components with 100 percent accuracy.
3.02	(Identify Typical Auto Frame Construction and Explain Importance of Frame Alignment) Given diagrams of different auto-body frames or sample automobiles with different frames, identify the basic frame types and parts to the standards of the instructor.

MODULE 3.0 INTRODUCTION TO BODY AND FRAME CONSTRUCTION

TASK 3.01 IDENTIFY PARTS OF TYPICAL AUTO BODY CONSTRUCTION

PERFORMANCE OBJECTIVE:

Given diagrams of different auto body parts and construction, identify by proper name the components with 100 percent accuracy.

PERFORMANCE ACTIONS:

3.0101 Identify by correct terminology:

a. Major Parts:
    (1) Inner panels
    (2) Outer panels
    (3) Doors and deck lids
    (4) Hoods
    (5) Fenders
    (6) Roof panels
    (7) Floor pans
    (8) Rear quarter panels
    (9) Center body pillars
    (10) Rocker panels
b. Exterior Trim: (Emphasized during 2nd year)
    (1) Molding
    (2) Ornaments
    (3) Locks
    (4) Bumpers
    (5) Grille
c. Interior Trim: (Emphasized during 2nd year)
    (1) Seats
    (2) Door Trim
    (3) Interior Molding

3.0102 Distinguish between unitized and conventional frame body construction to the satisfaction of the instructor.

PERFORMANCE STANDARDS:

- Identify parts of typical auto body construction to the satisfaction of the instructor and so that correct terminology will be used 100 percent of the time.

SUGGESTED INSTRUCTION TIME: 12 Hours

MODULE 3.0 INTRODUCTION TO BODY AND FRAME CONSTRUCTION

TASK 3.02 IDENTIFY TYPICAL AUTO FRAME CONSTRUCTION AND EXPLAIN IMPORTANCE OF FRAME ALIGNMENT

PERFORMANCE OBJECTIVE:

Given diagrams of different auto-body frames or sample automobiles with different frames, identify the basic frame types and parts to the standards of the instructor.

Minimum frame types: a. Conventional
b. Unitized body-frame

(NOTE: This is an introductory task: Detailed study of frame design and alignment will be covered later.)

PERFORMANCE ACTIONS:

3.0201 Distinguish between conventional and unitized body-frames.

3.0202 Describe the different types of conventional body-frames such as channel iron, I-beam and side box rail sections.

3.0203 Describe the basic unitized body-frame design:

a. Describe FLOOR of unitized body-frame.
b. Describe typical designs of STUD FRAME of unitized body frame.

3.0204 Describe concept of TORQUE BOXES.

3.0205 Explain the importance of FRAME ALIGNMENT.

PERFORMANCE STANDARDS:

- Recognize conventional and unitized body-frame designs upon inspection.
- Identify parts of typical auto frame construction and explain importance of frame alignment to the standards of the instructor.
- 100 percent accuracy in terminology.

SUGGESTED INSTRUCTION TIME: 3 Hours

TASK 3.02 IDENTIFY TYPICAL AUTO FRAME CONSTRUCTION AND EXPLAIN IMPORTANCE OF FRAME ALIGNMENT (Con't.)

RELATED TECHNICAL INFORMATION:

- Design of:
    a. I-Beam.
    b. Angle Iron.
    c. Channel Iron.
    d. Box Channel.
- Design of: Strengthening a box channel with reinforcing strip.

Module 3.0

STUDENT: ____ DATE: __________

PERFORMANCE TESTS:

1. a. Correctly identify the types of frames from given drawing illustrating each basic type of frame. Performance must be to the instructor's standards.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

b. Inspect two given automobiles in the field or in the shop and identify which one has a conventional and which one has a unitized body frame construction. Performance must be 100 percent accurate.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

2. Identify by correct terminology the location of body parts when given a drawing clearly illustrating each part. Performance must be 100 percent accurate.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

Module 3.0

STUDENT: ______________________________ DATE: ____________

1. The auto body includes the ____
   a. wheels, tires, and brakes
   b. hood, engine, and better
   c. trunk, fuel tank, and exhaust pipe
   d. sheet metal, underbody, and frame

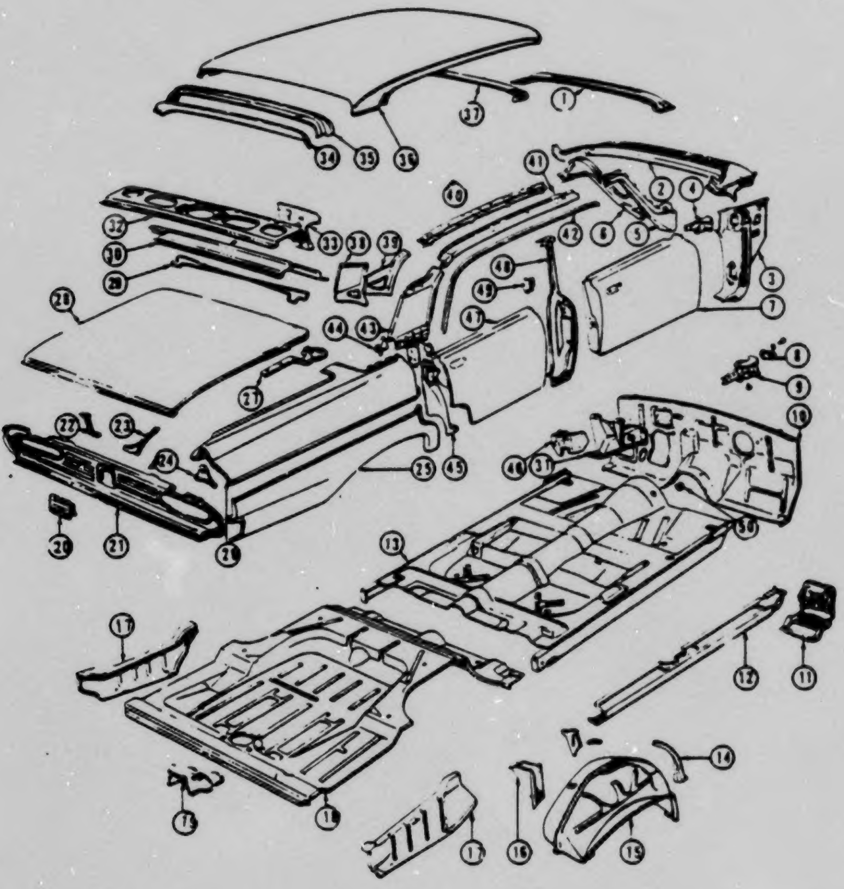
2. Which of the following is not a part of the cowl? ____
   a. dash
   b. firewall
   c. floor board
   d. quarter panel

3. Which of the following parts is not a moving part? ____
   a. door
   b. hood
   c. top
   d. deck lid

4. Does the unitized body construction provide overall body rigidity? ____
   a. yes
   b. no
   c. sometimes
   d. never

5. Where is the rocker panel located? ____
   a. below the rear deck
   b. below the doors
   c. below the radiator
   d. above the rear quarter panel

6. Study the below illustration. Place the number which identifies the panel on the blank line in front of the name of the panel at the bottom.


1
37
34
35
36
41
2
4
40
42
6
5
32
33
38
39
3
30
29
48
49
28
47
7
44
43
8
9
27
10
22
23
24
25
45
46
31
20
21
26
13
50
17
12
11
14
18
16
15
19

A. cowl top panel A. ____________

B. rear floor B. ____________

C. dash panel C. ____________

D. quarter wheelhouse D. ____________

E. rocker panel E. ____________

F. roof panel F. ____________

G. lower quarter panel G. ____________

H. center pillar H. ____________

I. upper quarter panel I. ____________

MODULE 4.0

TOOLS AND EQUIPMENT

The purpose of this unit is to prepare the student to select, use, and care for typical auto body mechanic hand tools; and use the tools according to recommended methods.

AUTO BODY
TOOLS AND EQUIPMENT
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 4.0	TOOLS AND EQUIPMENT	
4.01	Use Auto Mechanics Hand Tools	6
4.02	Use Auto Body Repair Hand Tools	15
4.03	Power Tools and Equipment	30
4.04	Frame and Underbody Repair Tools and Equipment	6
4.05	Identify and Properly Use Common Automotive Shop Machinery	9
4.06	Spray Equipment	15
	TOTAL	81

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 4.0	TOOLS AND EQUIPMENT
4.01	(Use Auto Mechanics Hand Tools) Given a basic, auto mechanics tool set and a requirement to use hand tools, demonstrate proper knowledge of tool terminology and the correct use and care of hand tools in disassembly and assembly of the body. Tools will be used following recommended procedures, using the correct or most appropriate tool for the job. Tools will not be damaged due to improper use or lack of care. Tools will be returned to tool box and storage after use.
4.02	(Use Auto Body Repair Hand Tools) Given instruction, basic auto body repair hand tools, and a situation in which to demonstrate use of tools; identify tools by correct terminology and size, select, use, and care for auto body mechanics hand tools.
4.03	(Power Tools and Equipment) Given instruction on use of power tools used in auto body repair, properly select and use and care for power tools.
4.04	(Frame and Underbody Repair Tools and Equipment) Given instruction, access to frame and underbody repair tools and equipment and accessories and typical applications (possibly simulations), demonstrate knowledges of tools and equipment terminology and demonstrate ability to properly select, use, and care for shop frame and underbody repair tools and equipment.
4.05	(Identify and Properly Use Common Automotive Shop Machinery) Given proper instruction, typical automotive shop machinery, and situations in which such machinery might be employed; state the purpose of given items of shop machinery and demonstrate proper use of machinery to standards of instructor.
4.06	(Spray Equipment) Given instruction, access to typical spray equipment or illustration of paint spray equipment; using no references identify typical spray equipment system by proper terminology. Instructor's standards apply.

TASK 4.01 USE AUTO MECHANICS HAND TOOLS

PERFORMANCE OBJECTIVE:

Given a basic, auto mechanics tool set and a requirement to use hand tools, demonstrate proper knowledge of tool terminology and the correct use and care of hand tools in disassembly and assembly of the body. Tools will be used following recommended procedures, using the correct or most appropriate tool for the job. Tools will not be damaged due to improper use or lack of care. Tools will be returned to tool box and storage after use.

Suggested Minimum Components of a Basic Tool Box:

- Conventional and metric wrenches
- Socket sets
- Screwdrivers
- Pliers
- Punches
- Brushes and Scrappers
- Ball Peen Hammers

In addition, Basic Auto Body Repair Tools suggested are:

- Special Dollies
- Hammers
- Body Spoons
- Pull Rods
- Body Files
- Snips
- Eye Protection Goggles
- Trim Tools
- Possibly, Pop-Rivit Gun

(NOTE: The auto body mechanic should purchase his own tool set and typically will be required to provide his own hand tools with the employer providing the larger, more expensive, or limited use tools. Typical shop tools include the vise, tap and die set, wrenches for heavy duty work, etc.)

PERFORMANCE ACTIONS:

4.0101 Correctly identify by terminology and size, if applicable, different types of hand tools used in auto body repair.

4.0102 Demonstrate ability to properly select the correct or most appropriate hand tool for a given job.

PERFORMANCE ACTIONS (Con't.):

4.0103 Demonstrate proper handling and storage and care of hand tools.

4.0104 Explain the dangers of using broken or worn-out tools.

PERFORMANCE STANDARDS:

- Correctly select and use and care for hand tools typically used by the auto body mechanic according to recommended procedures and meeting the instructor's standards.

SUGGESTED INSTRUCTION TIME: 6 Hours (Integrated throughout training.)

RELATED TECHNICAL INFORMATION:

- Metric (SI) System of measure (tool and fasteners).
- Proper methods of care for hand tools.
- Safety with hand tools.
- Recommended methods of using hand tools.

TASK 4.02 USE AUTO BODY REPAIR HAND TOOLS

PERFORMANCE OBJECTIVE:

Given instruction, basic auto body repair hand tools, and a situation in which to demonstrate use of tools; identify tools by correct terminology and size, select, use, and care for auto body mechanics hand tools.

Suggested Minimum Auto Body Mechanic Hand Tools:

- General-purpose, Dinging, Hammer
- Combination Bumping and Picking Hammer
- Assorted Dolly Blocks
- Body Spoons
- Assorted Pick Tools
- Solder Paddle
- Cold Chisels
- File and File Holder
- Vise-Grip Pliers
- Slide Hammer (Dent Puller)

(NOTE: The auto body mechanic generally is required to purchase his own hand tool set while the employer supplies larger, more expensive, or limited use tools.)

PERFORMANCE ACTIONS:

4.0201 Identify by proper terminology typical auto body hand tools to instructor's standards.

4.0202 Select and demonstrate proper use of auto body mechanic's hand tools as required for given jobs.

4.0203 Demonstrate proper care for hand tools. Return tools to proper storage area after use.

PERFORMANCE STANDARDS:

- Use proper terminology in identifying auto body mechanic's hand tools, select proper tool for given tasks, demonstrate proper use and care of hand tools, meeting instructor's standards and using tools according to recommended procedures.

SUGGESTED INSTRUCTION TIME: 15 Hours (Skill will be developed over a period of time.)

TASK 4.02 USE AUTO BODY REPAIR HAND TOOLS (Con't.)

RELATED TECHNICAL INFORMATION:

- Safety with hand tools.
- Proper methods of care for auto body mechanic's hand tools.
- Techniques of using hand tools.
- Terminology variations for same tool.
- Characteristics of metals.
- Variables in body construction.

STUDENTS' SELF-DIAGNOSTIC TEST FOR USING THE HAMMER CORRECTLY

If you are making marks when hammering, note where the marks are occuring and they will tell you how to correct your hammer blows.

If the hammer has left a mark to the left or right of the dent (target spot), then you are not holding the hammer straight in your hand. Turn the hammer slightly away from the side where it leaves the deepest mark.

If the hammer mark is fartherest away from you as you face the panel (to the top of the dent spot), then you are holding your elbow too high. Lower your elbow slightly to make the hammer head strike the spot squarely.

If the hammer mark is nearest you as you face the panel (to the bottom of the dent), you are holding your elbow too low. Raise your elbow slightly to square the hammer with the panel.

For initial practice, hammer a practice panel until the hammer is held correctly.

SOME BASIC HAND TOOLS OF THE AUTO BODY REPAIRER

MALLET	Hard rubber or heavy wood, used for soft blows which will not mark metal or injure paint.
PICK HAMMER	Round face used for most hammering operations while pick portion is round for entire length (about 6") slightly curved and tapered.
SQUARE FACE AND TAPER SHANK BEAD AND MOLDING HAMMER	Similar to the round shanked pick hammer and sometimes used for the same job. Typically it is used to form metal up to a corner. Can be used for most hammer-dolly jobs; however, sharp corners of the square head may mark the metal if proper techniques are not followed.
LOW CROWN DOLLY (HEEL)	Used to provide a backing for the hammer for most automobile surfaces, which are not curved, or for slight contours such as fender skirts, doors, tops of hoods. It can be used as a hammer for minor damage.
HIGH CROWN DOLLY (ALL PURPOSE UTILITY)	Used with bumping hammers for bringing up low spots, typically with high crown radius metal.
SURFACING SPOON	Used with a bumping hammer for reducing highs without damaging surrounding areas, the spoon distributes the hammers force over a broader area.
BODY FILE/HOLDER	The body file and holder are used for contour filling or rough finish work, to smooth the work after the hammering is finished.

TASK 4.03 POWER TOOLS AND EQUIPMENT

PERFORMANCE OBJECTIVE:

Given instruction on use of power tools used in auto body repair, properly select and use and care for power tools.

Hand Operated Power Tools may include:

- Pneumatic grinder
- Pneumatic hammer
- Electric grinder
- Pneumatic polisher
- Pneumatic drill
- Orbital sander
- Pneumatic file
- Impact wrench
- Metal shear
- Bench grinder
- Electric drills
- Cable pull unit (come-a-long, etc.)
- Electric polisher
- Jacks
- Porta Power (hand or hydraulic type)

PERFORMANCE ACTIONS:

4.0301 Identify, select, use, and care for pneumatic tools according to recommended procedures and meeting instructor's standards.

4.0302 Identify, select, use, and care for jacks according to recommended procedures and meeting instructor's standards including using safety stands as appropriate.

4.0303 Identify, select, use, and care for electric power tools of the auto body shop according to recommended procedures and meeting instructor's standards including all safety standards.

4.0304 Identify related or other shop power tools and equipment and demonstrate its use and care according to instructions given and instructor's standards.

(NOTE: Large shop equipment omitted: Described in separate task.)

TASK 4.03 POWER TOOLS AND EQUIPMENT (Con't.)

PERFORMANCE STANDARDS:

- Identify, select appropriate power tool and accessories, properly use and care for power tools and equipment of the auto body shop meeting instructor's standards.

SUGGESTED INSTRUCTION TIME: 30 Hours

Addendum to Task 4.03

MINIMUM SUGGESTED PERFORMANCE
POWER TOOLS

Portable Grinder:	- Remove paint - Buff and grind metal - Grind welds
Polisher:	- Polish paint
Drill:	- Drill and bore - Clean metal using wire brush attachment
Pneumatic Hammer:	- Cut spot welds - Remove panels - Chisel - Rivit
Orbital Sander:	- Smooth metal - Featheredge paint - Sand paint
Pneumatic File:	- Finishes plastic filler
Impact Wrench:	- Loosen and tighten bolts
Metal Shear:	- Cut sheet metal
Bench Grinder:	- Dresses punches and chisels - Sharpens drill bits - Grinds metals
Cable Pull Unit:	- Align body panels - Lift heavy objects
Vacuum Cleaner:	- Pick up dirt and dust - Pick up liquids (if wet-vac)
Cleaning Equipment:	- Clean under body areas, body, and engine
Service Jack and End Lift:	- Raise vehicle
Safety Stands:	- Secure lifted vehicle for safe work under it
Electric Welder:	- Weld frame members and rails

MODULE 4.0 TOOLS AND EQUIPMENT

TASK 4.04 FRAME AND UNDERBODY REPAIR TOOLS AND EQUIPMENT

PERFORMANCE OBJECTIVE:

Given instruction, access to frame and underbody repair tools and equipment and accessories and typical applications (possibly simulations), demonstrate knowledge of tools and equipment terminology and demonstrate ability to properly select, use, and care for shop frame and underbody repair tools and equipment.

SHOP FRAME AND UNDERBODY EQUIPMENT SHOULD BE IDENTIFIED ON AN ATTACHED SHEET WITH ACCOMPANYING MINIMUM PERFORMANCE ACTIONS FOR INTRODUCTORY TRAINING. (Attachments should be included by instructor to personalize guide to their program.)

(NOTE: This is an orientation task. Proficiency will be developed through actual use in specific tasks described later.)

PERFORMANCE ACTIONS:

4.0401 Identify, select, use, and care for PORTABLE BODY FRAME STRAIGHTENER.

4.0402 Identify, select, use, and care for STATIONARY REPAIR EQUIPMENT.

PERFORMANCE STANDARDS:

- For given tasks, identify by correct terminology, select, use, and care for portable body and frame straightener and station repair equipment following recommended procedures, manufacturer's instructions, and meeting instructor's standards.

SUGGESTED INSTRUCTION TIME: 6 Hours

MODULE 4.0 TOOLS AND EQUIPMENT

TASK 4.05 IDENTIFY AND PROPERLY USE COMMON AUTOMOTIVE SHOP MACHINERY

PERFORMANCE OBJECTIVE:

Given proper instruction, typical automotive shop machinery, and situations in which such machinery might be employed; state the purpose of given items of shop machinery and demonstrate proper use of machinery to standards of instructor.

(NOTE: Orientation to shop machinery. Proficiency will result from use of machinery during later training.)

PERFORMANCE ACTIONS:

4.0501 Identify and state purpose of given items of commonly used auto body repair or automotive shop machinery.

4.0502 Demonstrate the proper use of given (by instructor) items of shop machinery to instructor's standards.

PERFORMANCE STANDARDS:

- Identify given auto body shop machinery to standards of instructor.
- Demonstrate use of shop machinery as required by instructor to instructor's standards.

(NOTE: Competency in use of machinery/equipment typically will occur later in training when equipment/machinery is being used in auto body repair.)

SUGGESTED INSTRUCTION TIME: 9 Hours

RELATED TECHNICAL INFORMATION:

- Manufacturer's instructions and specifications.
- Safety precautions.
- Diagnostic information (if applicable) to indicate use of machinery.
- Vehicle specifications.

MODULE 4.0 TOOLS AND EQUIPMENT

TASK 4.05 IDENTIFY AND PROPERLY USE COMMON AUTOMOTIVE SHOP MACHINERY (Con't.)

TYPICAL MACHINERY REFERRED TO IN THIS TASK INCLUDES BUT MAY NOT BE LIMITED TO:

- Grinders
- Drills
- Jacks
- Lifts
- Air Compressor
- Front End Aligner
- Wheel Balancer
- Battery Charger

ELECTRIC DRILL SAFETY

1. Select the correct drill or bit for your work and mount it securely to the full depth of the chuck.
2. Stock to be drilled must be held in a stationary position so it cannot be moved during the operation.
3. Connect drill to a properly grounded outlet.
4. Turn on the switch for a moment to see if the bit is properly centered and running true.
5. With switch off, place the point of the bit in the punched layout hole.
6. Hold drill firmly in one or both hands at the correct drilling angle.
7. Turn on the switch, feed the drill into the work. The pressure required will vary with the size of the drill and the kind of wood.
8. During the operation, keep the drill aligned with the direction of the hole.
9. When drilling deep holes, especially with a twist drill, withdraw several times to clear the cuttings.
10. Follow the same precautions and procedures as when drilling holes with a hand drill or the drill press.
11. Always remove the bit from the drill as soon as you have completed your work.
12. Do not use the electric power drill when working on wet ground unless provisions are made to prevent possible shock hazards.
13. Take care in the placement of electrical power cords.
14. Place the electric drill in a place and position where it will not be damaged when you have completed drilling.
15. When finished with the drill, clean it and return it to proper storage.

BELT AND DISC SANDER SAFETY

1. Check sanding belt or disc for breaks or tears.
2. Wear eye protection devices when using any sander.
3. Keep fingers away from abrasive surfaces of sanders.
4. Sand on the down stroke of a belt sander and on the down side of a disc sander.
5. Secure work to be sanded and watch for irregular shapes.
6. Keep moving evenly and steadily over area to be sanded. Apply only sufficient pressure to smooth surface being sanded.
7. When sanding is completed, remove electrical plug, clean sander according to shop procedures, and return sander to proper station.

TASK 4.06 SPRAY EQUIPMENT

PERFORMANCE OBJECTIVE:

Given instruction, access to typical spray equipment or illustration of paint spray equipment; using no references identify typical spray equipment system by proper terminology. Instructor's standards apply.

(NOTE: Typical spray equipment found in shop where student is receiving training applies, although instructor may introduce other equipment for orientation.)

PERFORMANCE ACTIONS:

4.0601 Identify air compressor and visible major component parts: (Optional)

a. Safety precautions.
    (1) Pressure-activated cutoff switch
    (2) Safety release, pop-off valve
    (3) Head pressure release mechanism
    (4) Low-oil cutoff switch
b. Operation.
c. Care of compressor.

4.0602
a. Identify air transformer or regulator.
b. Explain its purpose.
c. Identify typical air pressure readings/setting for shop air system.
d. Demonstrate proper procedures for draining the air transformer/regulator.

4.0603 Identify the shop air piping system and takeoffs.

4.0604 Demonstrate the proper method of connecting the spray gun to the air line takeoff.

PERFORMANCE STANDARDS:

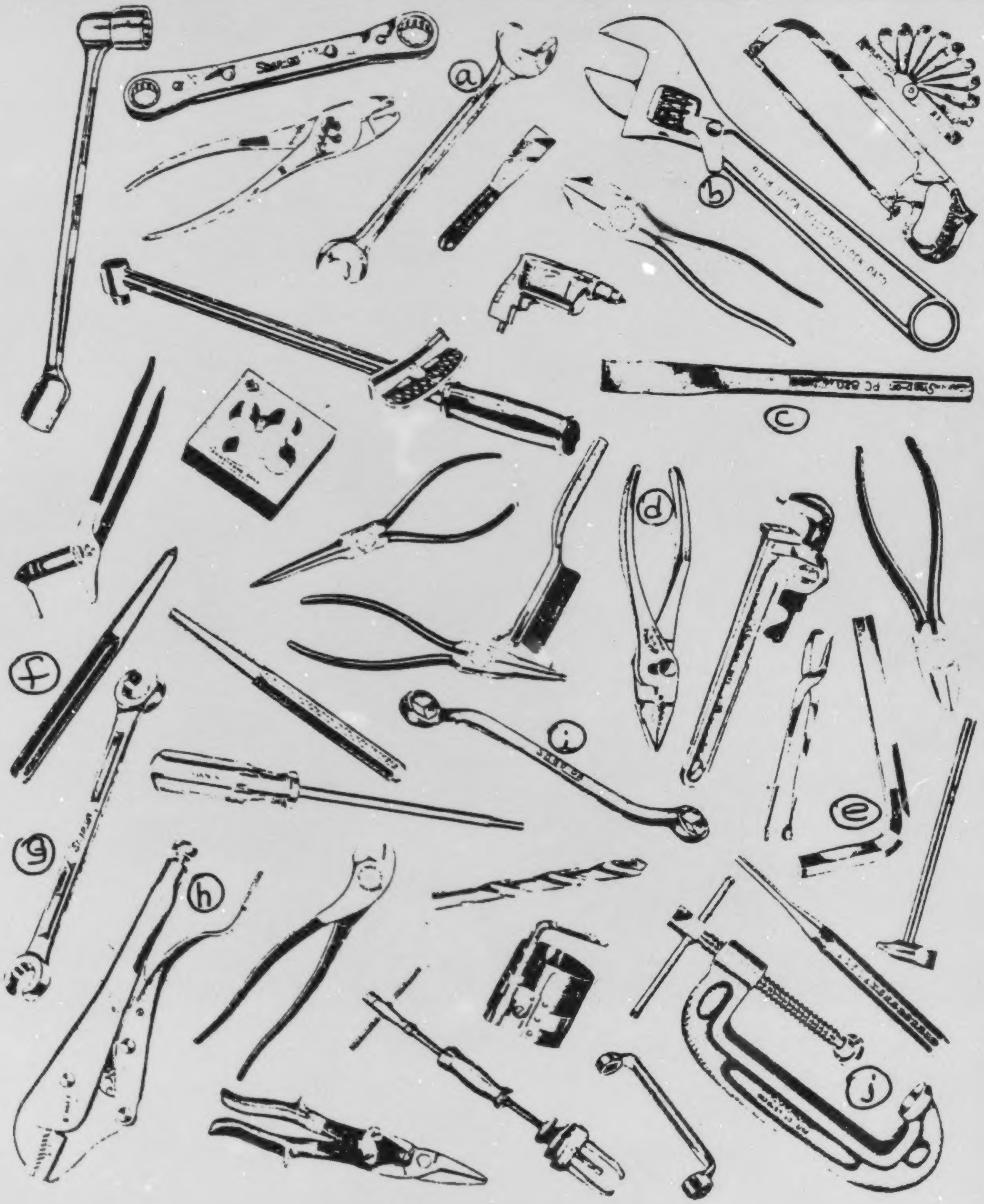
- Identify typical spray equipment system and components found in the auto body shop and demonstrate the proper procedures for connecting the spray gun to the compressed air system.

SUGGESTED INSTRUCTION TIME: 15 Hours

Module 4.0

STUDENT: ______________________________ DATE: ______________

Refer to the following drawings and identify the tools marked with circled letters. The correct terminology must be used.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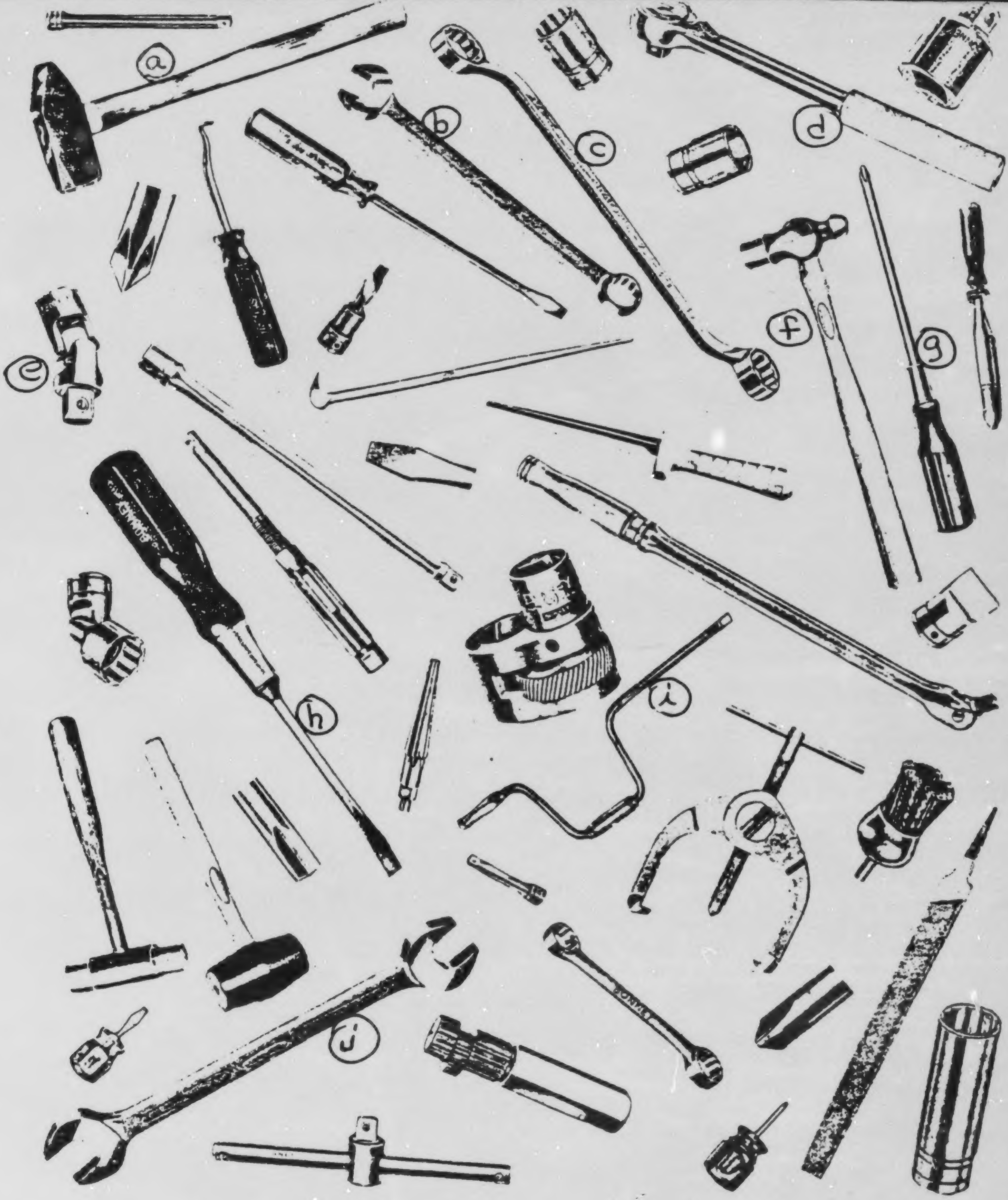
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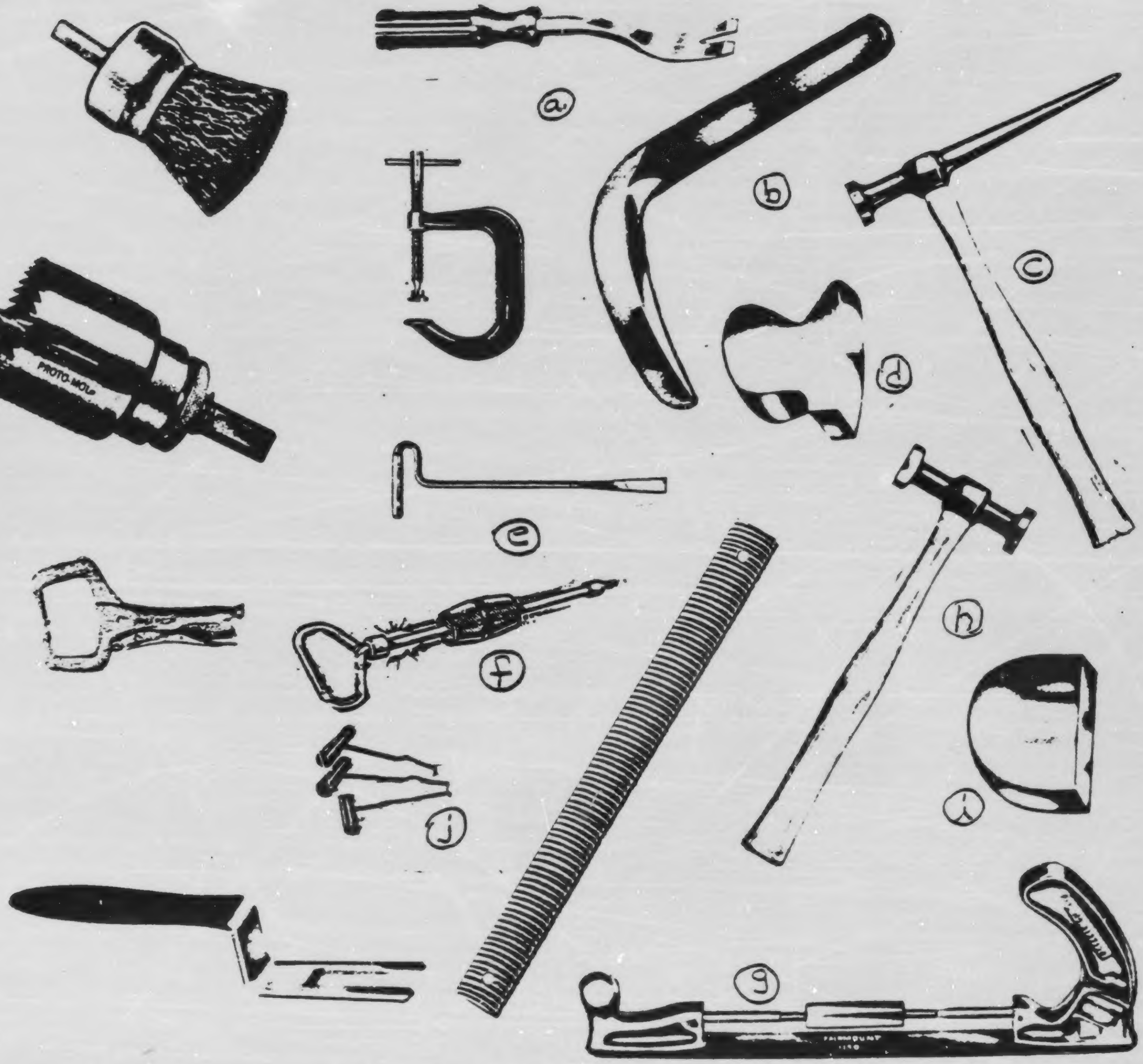
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f. ______________________
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i. ______________________
j. ______________________

4. Given auto body shop hand tools, power equipment, or shop machinery (items may be provided to student, labeled in shop, or pointed out by the instructor), identify the item by correct terminology. (A minimum of ten items is suggested.)

a. ________________

b. ________________

c. ________________

d. ________________

e. ________________

f. ________________

g. ________________

h. ________________

i. ________________

j. ________________

5. Of the ten items above, demonstrate the proper use of five (5) of the items selected by the instructor. Performance must be to accepted practices and to the standards of the instructor.

	A	N	Comment
Item 1	( )	( )	________________________________
Item 2	( )	( )	________________________________
Item 3	( )	( )	________________________________
Item 4	( )	( )	________________________________
Item 5	( )	( )	________________________________

A = Acceptable

N = Not acceptable

MODULE 5.0

WELDING

This module contains elementary training objectives for Oxyacetylene (OAW) and ARC (SMAW) welding as well as for MIG (GMAW) welding.

Because of recent technological developments in the American automotive body field, many manufacturer's are recommending that the thinner but stronger sheet metal not be cut or welded by oxyacetylene or ARC methods but instead by gas metal arc (GMAW) [MIG] welding as well as by other methods.

It is projected that in the next few years there may be less need for ARC welding and more need for MIG welding in auto body shops where newer models of vehicles are repaired. MIG welding methods, in addition, may replace some oxyacetylene welding methods.

UNITS:

5.0 A	Oxyacetylene
5.0 B	ARC
5.0 C	MIG
5.0 D	Applied Welding

(NOTE: The detailed welding descriptions have been included for safety as well as basic skills training.)

UNIT 5.0 A

OXYACETYLENE (OAW) CUTTING/WELDING AND BRAZING

OXYACETYLENE WELDING, CUTTING, AND BRAZING

PREREQUISITES: None

OBJECTIVES: The objective of oxyacetylene welding, cutting, and brazing (OAW) is to develop entry level gas welding skills.

Oxyacetylene, welding, cutting, and brazing training develops the skills necessary to produce high quality single and multi-pass welds on thin sheet metal and mild steel in the flat, horizontal, vertical, and overhead positions. The auto body mechanic is trained to produce high quality flame cuts through the use of the manual gas flame. The mechanics will develop skill in producing high quality brazed joint on sheet metal.

Upon completing secondary training, the student should be skilled to set up OAW equipment and perform the requirements of OAW welding, cutting and brazing in the auto body shop.

Unit No. 5.0 Title: OXYACETYLENE CUTTING/WELDING

MODULE STANDARDS

(Standards that are in effect for the entire module and that are not optional. Standards applicable only to a particular set of tasks or functions will be described on the Performance Standards page.)

1. Select tip.

   a. Proper size for work to be done (thickness of metal).

2. Inspect tip for signs of damage or flaws that could create a hazard or impair performance.

   a. Seat area: Smooth and clean to ensure good metal seal with torch head.

   b. Cutting oxygen orifice: Free of slag or spatter or other obstruction that may deform oxygen stream and render a poor quality cut.

   c. Pre-heat flame orifices: Free of obstruction. (Clogged or obstructed orifices will extend required pre-heat time and result in poor performance and cutting efficiency.)

   d. O-Rings: Check for deterioation.

3. Install tip.

4. Set gas pressures for desired working pressure.

AUTO BODY
WELDING
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 5.0 A	OXYACETYLENE (OAW) CUTTING/WELDING AND BRAZING	
5.01	Oxyacetylene Cutting/Welding Terminology	N/A
5.02	Oxyacetylene Cutting/Welding Safety	
5.03	Perform Soap and Water Test (Safety)	***
5.04	Identifying Oxygen and Acetylene Gases and Cylinder Handling	*
5.05	Set Up Oxyacetylene Cutting/Welding Station	*
5.06	Clean Oxyacetylene Cutting/Welding Tips	*
5.07	Light the Torch	*
5.08	Adjusting Flame	**
5.09	Oxyacetylene Cutting	*
5.10	Preparing the Joint	*
5.11	Carrying the Puddle (Fuse)	*
5.12	Run a Bead With Filler Rod	*
5.13	Weld Open Butt Joint, All Positions	*
5.14	Fillet Weld, Lap Joint, Flat and Overhead Positions	*
5.15	Braze Sheet Metal	*
	TOTAL	75

*Integrated training
**See Task 5.07
***Orientation Task

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Unit 5.0 A	OXYACETYLENE (OAW) CUTTING/WELDING AND BRAZING
5.01	(Oxyacetylene Cutting/Welding Terminology) Given proper instructions, identify standard oxyacetylene cutting/welding terms, typically used in daily operations, on a written test with 80 percent accuracy. Use standard oxyacetylene cutting/welding terminology upon completion of the training module to the standards of the instructor.
5.02	(Oxyacetylene Cutting/Welding Safety) Given proper instructions concerning oxyacetylene cutting/welding safety; demonstrate proper use of protective clothing and equipment to protect against hazards in gas cutting/welding with 100 percent accuracy.
5.03	(Perform Soap and Water Test [Safety]) Given oxyacetylene cutting/welding equipment to be tested for leaks, neutral soap and water, and proper instruction; perform a soap and water leak test. Mark (with tape, etc.) all discovered leaks for repair. Hoses and torch will not leak after repair and test.
5.04	(Identifying Oxygen and Acetylene Gases and Cylinder Handling) Given proper instructions and demonstration, identify with 100 percent accuracy characteristics of oxygen and acetylene gases and demonstrate proper handling of cylinders to the standards of the instructor.
5.05	(Set Up Oxyacetylene Cutting/Welding Station) Given oxyacetylene torch, regulators, hoses, check valves, cylinder wrench, oxygen, and fuel cylinders and portable cart; set up a portable or stationary oxyacetylene cutting/welding station. The oxy-fuel equipment will not leak and will operate safety as the manufacturer intended.
5.06	(Clean Oxyacetylene Cutting/Welding Tips) Given oxyacetylene cutting/welding equipment, tip cleaners, and instructions; clean both cutting/welding tips.
5.07	(Lighting the Torch) Given oxyacetylene cutting/welding equipment, striker, sample sheet metal to be used in job; light torch (for cutting).

5.08 (Adjusting Flame) Given oxyacetylene cutting/welding equipment including striker, adjust flame for job.

5.09 (Oxyacetylene Cutting) Given oxyacetylene cutting equipment, set up the equipment for a cutting job, and cut given thin and thick sheet metal according to instructor's assignment.

5.10 (Preparing the Joint) Given sheet metal to clean and prepare for welding, select the best joint and prepare the joint for welding.

5.11 (Carrying the Puddle [Fuse]) Given oxyacetylene welding equipment and sheet metal to weld without filler rod, establish a molten puddle and run straight even beads (without filler) in the flat or other positions assigned by the instructor.

5.12 (Run a Bead With Filler Rod) Given oxyacetylene welding equipment, sheet metal, and filler rod, demonstrate the proper procedure for carrying the puddle with filler metal in the flat position or other positions that may be required by the instructor, to the instructor's standards.

5.13 (Weld Open Butt Joint, All Positions) Given oxyacetylene welding station, filler rod, sheet metal panels, personal safety equipment, and necessary tools and materials; groove weld a butt joint in all positions required by the instructor. The bead should be formed properly, straight, and uniform in ripple and width, with even height.

5.14 (Fillet Weld, Lap Joint, All Positions) Given oxy-fuel work station, sheet metal, rods; construct a lap weld in all positions, required by the instructor. The weld will be straight, have consistency of width and height with proper build up and no slag.

5.15 (Braze Sheet Metal) Given an oxyacetylene welding station, sheet metal, brazing rod, flux, personal safety equipment, and the necessary tools and materials; braze sheet metal. Bead must be straight and uniform in height and width, have a uniform ripple formation and have no undercut, porosity, craters, or oxidation.

UNIT 5.0 A OXYACETYLENE

TASK 5.01 OXYACETYLENE CUTTING/WELDING TERMINOLOGY

PERFORMANCE OBJECTIVE:

Given proper instructions, identify standard oxyacetylene cutting/welding terms, typically used in daily operations, on a written test with 80 percent accuracy. Use standard oxyacetylene cutting/welding terminology upon completion of the training module to the standards of the instructor.

PERFORMANCE STANDARDS:

- Eighty percent accuracy in identifying standard terminology typically used in oxyacetylene cutting/welding jobs.
- Upon completion of Module 4.0, use terminology to instructor's standards.

Terms and definitions adapted from: Welding, Cutting & Heating Guide, Denton, TX: Victor Equipment Co., pp. 54-57, 1977.

DEFINITIONS

ACETYLENE - Gas composed of two parts of carbon and two parts of hydrogen. When burned in an atmosphere of oxygen, it produces one of the highest flame temperatures obtainable.

ACETYLENE CYLINDER - Specially built container manufactured according to D.O.T. standards. Used to store and ship acetylene. (Occasionally called "tank" or "bottle.")

ACETYLENE REGULATOR - An automatic valve used to reduce acetylene cylinder pressures to torch pressures and to keep the pressures constant.

BEAD - Denotes the appearance of the finished weld; describes the neatness of the ripples formed by the metal while it was in an semiliquid state.

BEVEL - Angling the metal edge where welding is to take place.

BOND - Junction of the weld metal and the base metal.

BUILDUP - Amount a weld face is extended above the surface of the metals being joined.

BUTT JOINT - An assembly in which the two pieces joined are in the same plane, with the edge of one piece touching the edge of the other.

DEFINITIONS CON'T.

CARBURIZING - A carburizing flame is an oxygen-fuel gas flame with a slight excess of the fuel gas.

CONE - Inner visible flame shape of a neutral or near neutral flame.

CONTINUOUS WELD - Making the complete weld in one operation.

CORNER JOINT - Junction formed by edges of two pieces of metal touching each other at angle 90 degrees.

CRACKING - Action of opening a valve slightly and then closing the valve immediately.

CUTTING FLAME - Cutting by a rapid oxidation process at a high temperature. It is produced by a gas flame accompanied by a jet action which blows the oxides away from the cut.

CYLINDER- A container used to hold gases used in welding. See (Oxygen, Acetylene.)

EDGE JOINT - Joint formed when two pieces of metal are lapped with at least one edge of each at an edge of the other.

FILLER ROD - Metal wire that is melted and added to the welding puddle to produce the necessary increase in bead thickness. (See Welding Rod.)

FILLET - Weld metal in the internal vertex, or corner, of the angle formed by two pieces of metal, given the joint additional strength to withstand unusual stresses.

FILLET WELD - Metal fused into a corner formed by two pieces of metal whose welded surfaces are approximately 90 degrees to each other.

FLAME CUTTING - Cutting performed by an oxygen-fuel gas torch which has an oxygen jet.

FLAT POSITION - A horizontal weld on the upper side of a horizontal surface.

FUSION - Intimate mixing of molten metals.

HORIZONTAL POSITION - A weld performed on a horizontal seam at least partially on a vertical surface.

DEFINITIONS CON'T.

HOSE - Flexible medium used to carry gases from regulator to the torch. It is made of fabric and rubber.

JOINT - Where two pieces meet when a structure is made of smaller pieces.

LAP JOINT - A joint in which the edges of the two metals to be joined overlap one another.

LENS - A specially treated glass through which a welder may look at an intense flame without being injured by the harmful rays, or glare, radiating from this flame.

NEUTRAL FLAME - Flame which results from combustion of perfect proportions of oxygen and the welding gas. Used for most welding jobs.

ORIFICE - Opening through which gases flow. It is usually the final opening; or any opening controlled by a valve.

OUTSIDE CORNER WELD - Fusing two pieces of metal together, with the fusion taking place on the underpart of the seam.

OXIDIZING - Combining oxygen with any other substance. For example, a metal is oxidized when the metal is burned, i.e., oxygen is combined with all the metal or parts of it.

OXIDIZING FLAME - Flame produced by an excess of oxygen in the torch mixture, leaving some free oxygen which tends to burn the molten metal.

OXYGEN - A gas formed of the element oxygen. When it very actively supports combustion it is called burning; when it slowly combines with a substance it is called oxidation.

OXYGEN-ACETYLENE CUTTING - Cutting metal using the oxygen jet which is added to an oxygen-acetylene preheating flame.

OXYGEN-ACETYLENE WELDING - A method of welding which uses a fuel combination of two gases - oxygen and acetylene.

OXYGEN CYLINDER - A specially built container manufactured according to D.O.T. standards and used to store and ship oxygen.

DEFINITIONS CON'T.

OXYGEN REGULATOR - An automatic valve used to reduce cylinder pressures to torch pressures and to keep the pressures constant. They are never to be used as acetylene regulators.

PASS - Weld metal created by one progression along the weld.

PENETRATION - Depth of fusion into the base metal as measured from the surface of the base metal.

PREHEATING - Temperature to which a metal is heated before an operation is performed on the metal (welding, cutting, forming, etc.).

PUDDLE - Portion of a weld that is molten at the place the heat is supplied.

ROOT OF WELD - That part of a weld farthest from the application of weld heat and/or filler metal side.

SLAG INCLUSIONS - Non-fused, nonmetallic substances in the weld metal.

TACK WELD - Small weld used to temporarily hold together components of an assembly.

T-JOINT - Joint formed by placing one metal against another at an angle of 90 degrees. The edge of one metal contacts the surface of the other metal.

TIP - Part of the torch at the end where the gas burns, producing the high-temperature flame. In resistance welding, the electrode ends are sometimes called tips.

TOE OF WELD - Junction of the face of the weld and the base metal.

TORCH - The mechanism which the operator holds during gas welding and cutting, at the end of which the gases are burned to perform the various gas welding and cutting operations.

WELDING - Art of fastening metals together by means of interfusing the metals.

WELDMENT - Assembly of component parts joined together by welding.

UNIT 5.0 A OXYACETYLENE

TASK 5.02 OXYACETYLENE CUTTING/WELDING SAFETY

PERFORMANCE OBJECTIVE:

Given proper instructions concerning oxyacetylene cutting/welding safety; demonstrate proper use of protective clothing and equipment to protect against hazards in gas cutting/welding with 100 percent accuracy.

PERFORMANCE ACTIONS:

5.0201 Identify different types and uses of body protection clothing and devices used in gas cutting/welding with 100 percent accuracy:

a. Goggles: One-piece and two-piece to filter light rays and protect eyes from hot metal and sparks.
b. Welding gloves.
c. Protective clothing:
  (1) Welding aprons are recommended.
  (2) Recommendation: Do not wear trousers with cuffs.
  (3) Leather shoes or boots. (Recommendation: Do not wear canvas/cloth shoes.)

5.0202 Check oxyacetylene cutting/welding equipment for safe operation:

a. Test all hose and regulator connections with soap solution *(orientation task).
b. Never use oil or grease near oxygen and other fittings.
c. Identify oxygen and fuel cylinders without error.
d. Verify that cylinders are fastened in position correctly.
e. Inspect hoses, regulators for wear.
f. Check storage of empty and full cylinders for proper separation, position of cylinders, etc.

*See task "Perform Soap and Water Test".

5.0203 Check oxyacetylene cutting/welding work area for proper ventilation. Should meet OSHA Standards.

TASK 5.02 OXYACETYLENE CUTTING/WELDING SAFETY

PERFORMANCE ACTIONS (Con't.):

5.02 Demonstrate Safe Practices:

a. Use caution in picking up pieces of hot metal. Use pliers or tongs. Mark "hot" metal left to cool.
b. Keep combustibles from heat.
c. Protect others from heat and hot slag.
d. Don't weld a completely closed container (Danger of expansion explosion).

PERFORMANCE STANDARDS:

- Identify proper safety in oxyacetylene cutting/welding on a written knowledge test to acceptable standards of instructor.
- Demonstrate use of protective equipment used in cutting/welding.
- Demonstrate safe practices in welding.
- Practice proper ventilation techniques in cutting/welding.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identification of welding equipment.
- Orientation to dangers of oxyacetylene cutting/welding fumes or flash to welders.

NOTE: See "Safety Precautions for Oxygen and Acetylene," South Carolina Curriculum Guide for Welding, Columbia, SC: SC State Department of Education (Office of Vocational Education), 1972.

UNIT 5.0 A	OXYACETYLENE
TASK 5.03	PERFORM SOAP AND WATER TEST (SAFETY)

PERFORMANCE OBJECTIVE:

Given oxyacetylene cutting/welding equipment to be tested for leaks, neutral soap and water, and proper instruction; perform a soap and water leak test. Mark (with tape, etc.) all discovered leaks for repair. Hoses and torch will not leak after repair and test.

PERFORMANCE ACTIONS:

5.0301	Close torch valves.
5.0302	Apply normal pressure.
5.0303	Mix neutral soap and water.
5.0304	Brush soapy water over hoses and valves.
5.0305	Check for bubbles.
5.0306	Mark discovered leaks with tape.
5.0307	Relieve hose pressure.
5.0308	Repair hoses and torch as required.
5.0309	Recheck for leaks.

PERFORMANCE STANDARDS:

- Perform soap and water leak test on oxyacetylene cutting/welding equipment to instructor's standards.

SUGGESTED INSTRUCTION TIME: Orientation Task

RELATED TECHNICAL INFORMATION:

- Oxy-fuel cutting/welding equipment.
- Proper safety precautions.

UNIT 5.0 A OXYACETYLENE

TASK 5.04 IDENTIFYING OXYGEN AND ACETYLENE GASES AND CYLINDER HANDLING

PERFORMANCE OBJECTIVE:

Given proper instructions and demonstration, identify with 100 percent accuracy characteristics of oxygen and acetylene gases and demonstrate proper handling of cylinders to the standards of the instructor.

PERFORMANCE ACTIONS:

5.0401
- a. Identify with 100 percent accuracy characteristics of oxygen and acetylene gases.
- b. Describe potential dangers in handling both gases and typical pressures under which gases should be used.

5.0402 Identify difference between oxygen and acetylene cylinder with 100 percent accuracy.

5.0403 Demonstrate proper handling of gas cylinders:

- a. Fasten cylinders securely in upright position.
- b. Use proper method (or tool) to open/close cylinder valves.
- c. Demonstrate proper storage of cylinders.
- d. Demonstrate proper handling of cylinders in training.

PERFORMANCE STANDARDS:

- Identify major characteristics of oxygen and acetylene gases that apply to welding on a written knowledge test with 100 percent accuracy.
- Demonstrate proper handling of gas cylinders to the standards of the instructor.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 5.0 A OXYACETYLENE

TASK 5.05 SET UP OXYACETYLENE CUTTING/WELDING STATION

PERFORMANCE OBJECTIVE:

Given oxyacetylene torch, regulators, hoses, check valves, cylinder wrench, oxygen, and fuel cylinders and portable cart; set up a portable or stationary oxyacetylene cutting/welding station. The oxy-fuel equipment will not leak and will operate safely as the manufacturer intended.

PERFORMANCE ACTIONS:

5.0501 Chain cylinders to cart.

5.0502 Remove cylinder cap.

5.0503 Crack cylinder valves to clean out foreign particles and inspect threads.

5.0504 Attach regulators.

5.0505 Install check valves.

5.0506 Attach hoses.

5.0507 Attach hoses to torch. (Set proper pressure for tips being used.)

5.0508 Check for leaks.

PERFORMANCE STANDARDS:

- Oxy-fuel equipment will not leak and will operate safely as the manufacturer intended.
- Minimum on knowledge test concerning cylinder handling, regulators, and set up of oxy-fuel welding equipment.
- Set up oxyacetylene cutting/welding station to instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Safety:
  - a. Cylinder storage and handling
  - b. Purging equipment
  - c. Gas: (1) Pressures, (2) Ventilation
  - d. Inspection procedures
- Manufacturer's specifications and instructions.

UNIT 5.0 A OXYACETYLENE

TASK 5.06 CLEAN OXYACETYLENE CUTTING/WELDING TIPS

PERFORMANCE OBJECTIVE:

Given oxyacetylene cutting/welding equipment, tip cleaners, and instructions; clean both cutting/welding tips.

(NOTE: This objective will become standard practice when using oxyacetylene welding and cutting equipment.)

PERFORMANCE ACTIONS:

5.0601 Examine tip to determine orifice (opening) size, and condition of orifice end of tip.

5.0602 Select proper (correct size) tip cleaner(s).

5.0603 (May be optional or orientation only). Smooth flame end of tip if it is scratched or rough (file orifice end) or use tip reamer.

5.0604 Clean tip:

a. Start with tip cleaner two sizes smaller than tip orifice.
b. Use straight push-pull action to eliminate egg-shaped opening.
c. Gradually increase tip cleaner size to original orifice size.
d. Where possible, insert long tip cleaners through back of tip.

PERFORMANCE STANDARDS:

- Clean tips to instructor's standards or manufacturer's recommendations, avoiding damage to tip, and reporting and damaged tips to instructor.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Determine that tips are being used with torches from the same manufacturer.
- Identify various tips.
- Identify typical tip sizes (No standard numbering system).

UNIT 5.0 A OXYACETYLENE

TASK 5.07 LIGHTING THE TORCH

PERFORMANCE OBJECTIVE:

Given oxyacetylene cutting/welding equipment, striker, sample sheet metal to be used in job; light torch (for cutting).

(NOTE: Tasks of (a) lighting the torch and (b) adjusting the flame typically will be accomplished as a continuing action.)

PERFORMANCE ACTIONS:

5.0701 Select proper tip size for job. (Determine by thickness of sheet metal.)

5.0702 Set regulator pressure for job.

5.0703
a. Open oxygen valve on torch handle.
b. Adjust oxygen regulator to desired delivery range.

5.0704
a. Open fuel valve on torch handle (1/2 turn).
b. Adjust fuel regulator to required delivery tange.

5.0705 Point torch head (flame direction) away from persons, cylinders, or flammable materials before lighting.

5.0706
a. Open torch fuel valve approximately 1/2 turn.
b. Ignite gas. Hold torch in one hand and the spark lighter in the other hand.

PERFORMANCE STANDARDS:

- Select proper tip for welding job; adjust regulators according to text or teacher's instructions or manufacturer's standards; use proper safety equipment; and light torch.
- (Task typically will be accomplished jointly with adjusting flame.)

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Able to set up oxy-fuel cutting/welding station.
- Selection of cutting/welding tips.
- Wear protective goggles to shield against bright light.

UNIT 5.0 A OXYACETYLENE

TASK 5.08 ADJUSTING FLAME

PERFORMANCE OBJECTIVE:

Given oxyacetylene cutting/welding equipment including striker, adjust flame for job.

(NOTE: Tasks of (a) lighting torch and (b) adjusting flame typically will be accomplished as a continuous action.)

PERFORMANCE ACTIONS:

5.0801 Light torch. (Point flame away from persons, cylinders, or any flammable materials.)

5.0802
- a. Keeping opening fuel valve until flame stops smoking and leaves end of tip by about 1/8 inch.
- b. Then, slightly reduce fuel supply to bring flame back to tip.

5.0803 Open torch oxygen needle adjustment valve until a bright neutral flame (for cutting) is reached.

PERFORMANCE STANDARDS:

- Adjust torch to a neutral flame (for cutting) to meet manufacturer's specifications, or instructor's standards.
- (Task may be accomplished jointly with lighting the torch.)

SUGGESTED INSTRUCTION TIME: (See Task 5.07)

RELATED TECHNICAL INFORMATION:

Caution: If backfire or flashback is experienced, immediately turn off oxygen valve, then turn off fuel valve.

- Oxidizing flame.
- Carburizing flame.

TASK 5.09 OXYACETYLENE CUTTING

PERFORMANCE OBJECTIVE:

Given oxyacetylene cutting equipment, set up the equipment for a cutting job, and cut given thin and thick sheet metal according to instructor's assignment.

PERFORMANCE ACTIONS:

5.0901 Make usual preparations for cutting.

5.0902
a. Set oxygen regulator.
b. Set acetylene regulator.
c. Adjust as necessary.

5.0903
a. Turn on acetylene valve.
b. Light torch with sparklighter (striker).
(NOTE: Avoid using butane lighters and matches!)

5.0904
a. Turn on oxygen preheating valve.
b. Adjust to neutral flame.

5.0905 Press oxygen high-pressure lever and observe preheating flame.

5.0906 Position sheet metal.

5.0907
a. Hold torch tip at right angle to metal with inner cones +/- 1/2 inch above metal.
b. Heat edge of metal to bright red (at guideline).
c. Press oxygen cutting level and move torch forward along guidelines to begin cut.

5.0908 Move torch fast enough to maintain smooth, even cut on sheet metal. (If cutting actions stops, release oxygen cutting lever and preheat at end of kerf and continue cut when steel becomes red.)

PERFORMANCE STANDARDS:

- Set up complete oxyacetylene cutting station following proper sequence and safety precautions.
- Light and properly adjust flame for cutting job.
- Cuts must meet the instructor's standards and industry standards.
  (NOTE: Proper cutting speed can be mastered only through experience.)

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Oxyacetylene safety: Equipment, operation, personal.
- Cut lines outlined by soapstone or chalk.

RECOMMENDED:

- Use only enough flame to cut sheet metal.

TASK 5.10 PREPARING THE JOINT

PERFORMANCE OBJECTIVE:

Given sheet metal to clean and prepare for welding, select the best joint and prepare the joint for welding.

PERFORMANCE ACTIONS:

5.1001 Select type of joint: (Select simplest joint to produce strongest weld possible.)

a. Lap.
b. Butt.
(NOTE: Instructor may require orientation to Edge, Corner, and T joints.)

5.1002 Prepare joint:

a. Prepare metal for deep penetration, keeping metal edges true and straight.
b. Clean and dry metal prior to welding.

PERFORMANCE STANDARDS:

- The best (simplest) joint to produce the strongest weld possible must be chosen as judged by the welding instructor and the joint must be properly prepared for welding, to include free from any material that might weaken the weld.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Oxyacetylene cutting.
- Metal characteristics (thickness and appropriate welding joints).
- Consideration in alignment of long lengths of body panels for lap weld.

UNIT 5.0 A OXYACETYLENE

TASK 5.11 CARRYING THE PUDDLE (FUSE)

PERFORMANCE OBJECTIVE:

Given oxyacetylene welding equipment and sheet metal to weld without filler rod, establish a molten puddle and run straight even beads (without filler) in the flat or other positions assigned by the instructor.

PERFORMANCE ACTIONS:

5.1101 Put on safety equipment.

5.1102 Position, sheet metal as instructed and to the standards of the instructor.

5.1103 Set up oxyacetylene welding station and adjust regulators.

5.1104 Light torch and adjust for a neutral flame.

5.1105 Point flame in direction of weld at 35-45 degree angle with no side angle.

5.1106 Lower torch until inner flame is about 1/2 inch from metal.

5.1107 (Recommend) Begin weld at right hand edge of metal. (If right handed.)

5.1108 Move flame in small circle until pool of molten metal forms (about 1/4 inch in diameter).

5.1109 Move flame along line of intended weld to form overlapping circles (carry the puddle) in uniform bead. (Scribe a line or use a straight edge to help puddle a straight bead.)

(NOTE: Practice will be required to develop skill in puddling.)

PERFORMANCE STANDARDS:

- Run a bead without filler rod, according to the instructor's standards, keeping the bead straight and maintaining a uniform puddle.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

TASK 5.11 CARRYING THE PUDDLE (FUSE) (Con't.)

RELATED TECHNICAL INFORMATION:

- Safety procedures.
- Setting up oxy-fuel station.
- Flame adjustment.

UNIT 5.0 A OXYACETYLENE

TASK 5.12 RUN A BEAD WITH FILLER ROD

PERFORMANCE OBJECTIVE:

Given oxyacetylene welding equipment, sheet metal, and filler rod, demonstrate the proper procedure for carrying the puddle with filler metal in the flat position or other positions that may be required by the instructor, to the instructor's standards.

PERFORMANCE ACTIONS:

5.1201 Put on safety equipment. Take safety precautions.

5.1202 Position sheet metal.

5.1203 Set up oxy-fuel welding station.

5.1204
a. Establish puddle with torch angle 30-45 degrees.
b. Place inner cone about 1/2 inch from sheet metal puddle.

5.1205 Begin travel when a molten puddle is established.

5.1206 Add filler rod to puddle, withdraw as necessary.

5.1207 Move puddle forward with torch, allowing puddle to form in base metal.

5.1208 Maintain puddle size and shape so that bead is smooth and in a straight line.

(NOTE: Practice will be required to develop consistently satisfactory results in running a bead.)

PERFORMANCE STANDARDS:

- Using oxyacetylene welding, run a bead with filler rod, in a straight line, with uniform width and height, with a weld penetrating about 100 percent thickness of metal base, consistently satisfactory to the instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Filler rod.
- Tip selection.
- Puddling.

UNIT 5.0 A OXYACETYLENE

TASK 5.13 WELD OPEN BUTT JOINT, ALL POSITIONS*

PERFORMANCE OBJECTIVE:

Given oxyacetylene welding station, filler rod, sheet metal panels, personal safety equipment, and necessary tools and materials; groove weld a butt joint in all positions required by the instructor. The bead should be formed properly, straight, and uniform in ripple and width, with even height.

PERFORMANCE ACTIONS:

5.1301 Prepare for oxy-fuel welding.

5.1302 Position sheet metal in butt joint, flat position.

5.1303 Tack weld each end of the joint to hold position.

5.1304 Run a bead, using acceptable standards (of industry), to weld a butt joint (all positions).

5.1305 Inspect weld for:

a. Proper penetration (100 percent).
b. Build up of weld around 1/16 inch above base surface.
c. Bead straight and over center of joint.

PERFORMANCE STANDARDS:

- Weld a butt joint.
- The bead must be properly formed, straight, and uniform in ripple and width, with even height.
- There must be no undercut, porosity, craters, or oxidation, and the weld must be fused with the base metal.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Tip and rod selection.
- Preparing metal for weld.
- Testing of weld.
- Safety.

*ALL POSITIONS = Flat, Horizontal, Vertical, and Overhead (to lesser degree)

UNIT 5.0 A OXYACETYLENE

TASK 5.14 FILLET WELD, LAP JOINT, ALL POSITIONS*

PERFORMANCE OBJECTIVE:

Given oxy-fuel work station, sheet metal, rods; construct a lap weld in all positions, required by the instructor. The weld will be straight, have consistency of width and height with proper build up and no slag.

PERFORMANCE ACTIONS:

5.1401 Make necessary preparations for welding.

5.1402 Position sheet metal for lap welding.

5.1403 Tack weld each of the plates.

5.1404 Start molten pool at end of joint, with or without filler rod and run bead to complete lap joint.

5.1405 Inspect weld for smoothness, even ripple, uniform and complete penetration.

(SPECIAL NOTE: Practice in oxyacetylene lap joint welding typically will be limited to conserve practice steel.)

PERFORMANCE STANDARDS:

- Weld lap joint of sheet metal with oxyacetylene equipment.
- The weld must be consistent and uniform, show uniform fusion, good surface ripple, and have no slag.
- The finished weld must meet the instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Welding procedures to ensure proper heating of top and bottom metal.
- Safety.

*Secondary training may concentrate on flat position.

UNIT 5.0 A OXYACETYLENE

TASK 5.15 (Optional) BRAZE SHEET METAL

PERFORMANCE OBJECTIVE:

Given an oxyacetylene welding station, sheet metal, brazing rod, flux, personal safety equipment, and the necessary tools and materials; braze sheet metal. Bead must be straight and uniform in height and width, have a uniform ripple formation and have no undercut, porosity, craters, or oxidation.

PERFORMANCE ACTIONS:

5.1501 Set up oxyacetylene welding station for brazing.

5.1502 Prepare sheet metal for brazing: Clean appropriately.

5.1503 Position and tack weld sheet metal.

5.1504 Braze weld butt joint using slightly oxidizing flame:

a. Use flux coated filler rod. OR
    (1) Heat end of filler rod.
    (2) Dip rod in flux allowing flux to cling to heated metal if not flux coated rod.
b. Heat tack welded areas to dull red; apply filler metal.

5.1505 Inspect weld.

PERFORMANCE STANDARDS:

- Braze weld sheet metal so that the finished weld is flat to slightly convex, gold in color and penetrates through the joint.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- When/when not to braze.
- Precaution against embrittlement.

Addendum to Task 5.0 A

CHECKLIST FOR WELD

	CHECK IF WELD PASSES INDUSTRY STANDARDS (omit if it does not)								
	Flat		Horzontal		Vertical		Overhead		*
	Butt	Lap	Butt	Lap	Butt	Lap	Butt	Lap	Brazing
1. Even bead.									
2. Even ripples in bead.									
3. Bead uniform in width.									
4. Proper height in bead (not excessive).									
5. No holes in weld.									
6. Weld not brittle.									
7. No excessive metal under joint.									
8. Proper penetration.									
9. No weld cracks.									
10. End crater filled.									
11. No cold overlaps along joint seam.									
12. Good fusion and penetration.									

*Optional task at secondary level.

STUDENT: ______________________________ DATE: __________

1. What color is the hose on an acetylene tank?

____ a. red
b. yellow
c. green
d. blue

2. Which of the following is not part of an oxyacetylene welder?

____ a. gauges
b. tanks
c. valve oil indent
d. control valve

3. Which is not a type of oxyacetylene flame?

____ a. neutral flame
b. carburizing type flame
c. oxidizing flame
d. customizing flame

4. When running a bead with the acetylene torch _____.

____ a. you start by heating the metal cherry red
b. you start by heating the metal to a molten puddle
c. you light the torch to a carbonizing flame
d. you light the torch to an oxidizing flame

5. While gas welding, if the torch pops and cracks while burning at a neutral flame, ____.

____ a. the oxygen valve should be opened more
b. both the oxygen and acetylene valves should be opened more
c. the acetylene valve needs to be opened more
d. both the oxygen and acetylene valves need to be closed

6. A flashback when using oxy-acetylene is caused by ____.

____ a. the flame is too low
b. the flame is too high
c. the flame is too hot
d. the cone is too far into the puddle

7. Welding 2 pieces of metal together is a process of ____.

____ a. fusing
b. tacking
c. brazing
d. soldering

8. On the acetylene regulator, the connecting nut has ____.

____ a. left handed threads
b. right handed threads
c. an interference fit
d. 1/4 x 20 thread

9. The metals joined in brazing are _____.

____ a. melted together
b. tacked together
c. leaded together
d. soldered together

10. A brazing rod is made of ____.

____ a. steel
b. brass
c. lead
d. solder

11. Brazing-in can be used to fasten together

____ a. two pieces of the same metal
b. two different metals
c. a crack in cast iron
d. all of the above

12. The oxygen-cylinder regulator has ____.

____ a. one gauge
b. two gauges
c. three gauges
d. four gauges

13. A neutral flame on the welding torch

____ a. is used to braze with
b. is used to apply body solder
c. does not change the chemical composition of melted metal
d. burn off paint

14. When acetylene is added to a neutral flame it becomes

____ a. a carbonizing flame
b. an oxidizing flame
c. a shrinking flame
d. a hotter flame

15. The type of welding equipment most frequently used in auto body repair currently is ____.

____ a. ARC
b. MIG
c. oxy-acetylene
d. TIG

16. The gas welding process creates heat from an acetylene flame burning in

____ a. pure tungsten
b. propane
c. argon
d. pure oxygen

17. When setting up the torch, before attaching regulators, you should always

____ a. clean the tanks
b. chain down the tanks
c. crack the valves
d. have tanks on a truck

18. For safety reasons, the torch tanks should always

____ a. be chained down to carrier cart
b. be grounded
c. kept clean
d. kept in a dark place

19. When using welding tips, the higher the number

____ a. the brighter the flame
b. the hotter the flame
c. welds thicker metal
d. will not burn the metal

20. There are 5 major parts of the acetylene welding outfit. These include the

____ a stricker
b. welding rods
c. tip cleaners
d. regulators

UNIT 5.0 B

SHIELDED METAL ARC WELDING (SMAW)

SHIELDED METAL ARC WELDING (SMAW)

(ARC)

PREREQUISITE:	None
OBJECTIVE:	Shielded Metal Arc Welding (SMAW) is designed to develop basic ARC welding skills for the entry-level auto body mechanics. The student will learn the skills of striking the arc, maintain proper arc length, setting up SMAW equipment, and manipulating the electrode. Emphasis will be on welding frame, angle or channel iron, and braces in auto body repair.

AUTO BODY
SHIELDED METAL ARC WELDING
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 5.0 B	SHIELDED METAL ARC WELDING	
5.01	Introduction (Principles) of Arc Welding	*
5.02	Safety in Arc Welding	*
5.03	Machines and Accessories	*
5.04	Select Electrode	*
5.05	Striking and Maintaining (Substaining) an Arc (Flat Position)	*
5.06	Chip Slag Using Chipping Hammer	*
5.07	Run Short Beads, Flat Position (Training Task)	*
5.08	Run Continuous Beads, Flat Position (Training Task)	*
5.09	Prepare Joint	*
5.10	Construct Open Butt Weld, All Positions	*
5.11	Construct Lap Joint Weld, 3/8 Inch Equal Legs, Three Passes	*
	TOTAL	6

*Integrated training

TASK LISTINGS
AUTO BODY

MODULE/UNIT	DESCRIPTION
Unit 5.0 B	SHIELDED METAL ARC WELDING
5.01	(Introduction [Principles] of Arc Welding) Given instructions and an orientation to various welding processes, identify shielded metal arc welding as a process, describe the electric arc.
5.02	(Safety in Arc Welding) Given instruction concerning arc welding safety, demonstrate safety precautions recommended by the instructor and text (industry standards) concerning the handling of hot metal, high current electricity, toxic fumes, large quantities of ultraviolet rays, droplets of molten metals, and proper setting of arc welding machines.
5.03	(Machines and Accessories) Given instruction concerning machines and accessories for arc welding, demonstrate the proper procedures to set up given shielded metallic arc (ARC) welding equipment to the instructor's standards (standards of industry or manufacturer).
5.04	(Select Electrode) Given an orientation to arc welding electrodes, select electrode and describe how to properly store and conserve electrodes during training.
5.05	(Striking and Maintaining [Substaining] and Arc [Flat Position]) Given instruction, safety protective equipment, welding machine-equipment-accessories, and electrodes, and angle iron or frame channel; strike and maintain an arc to the instructor's standards.
5.06	(Chip Slag Using Chipping Hammer) Given a welded joint and chipping hammer; remove slag from weld. Weldment must be free of all removable slag.
5.07	(Run Short Beads, Flat Position [Training Task]) Given instructions, arc welding machine, safety equipment accessories, mild steel plate, and electrode; run short beads to the instructor's standards. Flat position.
5.08	(Run Continuous Beads, Flat Position [Training Task]) Given instructions, arc welding machine-equipment-accessories (including safety clothing), electrode and metal plate; run continuous beads to the instructor's standards.

5.09 (Prepare Joint) See related tasks in Oxyacetylene Welding. Given metal to clean and prepare for welding, select the best joint and prepare the joint for arc welding.

5.10 (Construct Open Butt Weld, All Positions) Given a shielded metal arc welding station, mild steel coupons, electrodes, personal safety equipment, and the necessary tools and materials, construct open butt welds, 1/16 inch root opening, in all positions (flat, horizontal, vertical, and overhead). Bead must be straight and uniform in height and width; have no oxidation, weld must be fused with base metal and have full penetration.

5.11 (Construct Lap Joint Weld, 3/8 Inch Equal Legs, Three Passes) Given a shielded metal arc welding station, mild steel coupons, electrode, personal safety equipment, and the necessary tools and materials; construct a three pass lap joint weld, 3/8 inch equal legs. Beads must be straight and uniform in height and width; have a uniform ripple formation; and have no undercut porosity, craters, or oxidation. Weld must be fused with base metal and show no visible penetration on opposite side of weld.

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SUPPLEMENT TO STANDARDS

ARC WELDING

The following descriptions may help standardized reporting of student competencies in arc welding.

Level 4 Competency		Level 3 Competency	Level 2 Competency
1 a Stringer beads	-- no variation	1. a. Little or no variation.	1. a. Height and width may vary from bead to bead, but it would still be in the tolerance of acceptability.
b Fillet welds	-- contour of face is good depending on electrode type. Size of legs do not vary above or below the recommended lead size.	b. Contour of face is good depending on electrode type. Size of legs may vary 1/16" or less above or below the recommended lead size.	b. Fillet weld may vary from bead to bead also with leg size slightly smaller or larger and the contour of the face changing slightly from bead to bead.
2 Starting a weld	-- starts good 100% of the time	2. Starts good 90% of the time	2. May be higher or wider or narrower, but also acceptable.
3 Uniform flux lines	-- spacing and shaping are good. -- does not vary.	3. Spacing and shaping are good--may vary on occasion. (For example, 4 goods out of 5 times.)	3. Some rounded shapes and arrow shapes. Spacing would vary with speed or placement of the electrode in the puddle.
4 Tie-ins	-- does not have a high buildup.	4. May have a high buildup sometimes, but still a good restart and on occasion, make a perfect restart.	4. Some tie-ins overlap crater properly or overlap too far.
5. End of weld	-- does not leave excessive metal buildup at end of crater. Never oversized.	5. May leave excessive metal buildup at end of crater but never oversize.	5. The crater not quite filled or overfilled.
6 Undercut	-- no undercut or overlap	6. Very little, if any undercut--maybe a slight trace of overlap on occasion.	6. Slight undercut is okay within an acceptable tolerance and may be some overlap.
7 Excessive spatter	-- arc length and amperage setting proper all of the time.	7. Arc length and amperage setting proper most of the time.	7. Fluctuating arc length and amperage setting.
8. Dirty welds	-- all clean welds.	8. No dirty welds.	8. Weld not always clean.

In reporting the proficiency of graduates, the following proficiency levels will be used:

Level	
0	No skill demonstrated or proficiency training not given in skill.
1	Individual's skill level not that generally expected for entry level employment.
2	Individual's skill level probably is that generally expected for entry level employment, but the individual probably will need close on-the-job supervision for a while longer.
3	Individual's skill level is that generally expected for entry level employment.
4	Individual's skill level is equal to that of a worker with some on-the-job experience.

UNIT 5.0 B — SHIELDED METAL-ARC WELDING (ARC WELDING)

TASK 5.01 — INTRODUCTION (PRINCIPLES) OF ARC WELDING

PERFORMANCE OBJECTIVE:

Given instructions and an orientation to various welding processes, identify shielded metal arc welding as a process, describe the electric arc.

PERFORMANCE ACTIONS:

5.0101 Contrast shielded metal arc welding (SMAW) as a process compared to oxy-fuel, MIG welding processes.

5.0102 Describe the electric arc.

5.0103 Distinguish between AC and DC current.

5.0104 Describe how polarity is used in welding.

5.0105 Interpret and use the terminology of arc welding.

(NOTE: This performance action will occur during the entire training period of arc welding.)

5.0106 Describe standards for evaluation of competencies in arc welding.

PERFORMANCE STANDARDS:

- Identify SMAW as a process and interpret and use the terminology of arc welding to the standards established by the instructor.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Arc welding terminology.

ARC WELDING TERMINOLOGY

The suggested minimum terminology for arc welding is included for standardization and was taken from the following source:

Walker, John R. Arc Welding Basic Fundamentals, South Holland, IL: The Goodheart-Wilcox Company, Inc., pp. 122-123, 1981.

AC (ALTERNATING CURRENT) - A current that reverses direction regularly as it rises and falls.

AMPERE - An electrical unit that indicates rate of flow of electricity through a circuit.

ARC LENGTH - Distance from end of electrode to surface of molten pool.

ARC VOLTAGE - Voltage across welding arc.

ARC WELDING - Process of joining metals by using heat of an electric arc, but without pressure.

BASE METAL - The metal to be welded.

BEVEL - Angle formed by a line or surface that is not at right angles to another line or surface.

BRITTLENESS - In some respects, opposite of toughness. The characteristic that causes metal to break easily.

BURR - Sharp edge remaining on metal after cutting, stamping or machining. A burr can be dangerous if not removed.

BUTT WELD - A weld made in the joint between two pieces of metal approximately in the same place.

CASEHARDENING - A process of surface hardening iron base alloys so that the surface layer or case is made substantially harder than interior or core.

CONTINUOUS WELD - A weld which extends without interruption for its entire length.

CRATER - Depression at end of a weld.

DC (DIRECT CURRENT) - Flow of electric current in one direction only.

DEPOSITED METAL - Metal that has been deposited during welding.

DEPTH OF FUSION - Distance that weld extends into base metal from its original surface.

EDGE PREPARATION - Contour prepared on edge of a member for welding.

ELECTRODE - A bare of flux coated wire or rod that is melted into base metal by an electric current passing through it.

ELECTRODE HOLDER - Device used to hold and position the electrode.

FACE OF WELD - Exposed surface of a weld, made by an arc or gas welding process, on the side from which the welding was done.

FATIGUE - Tendency for metal to break or fracture under repeated or fluctuating stresses.

FILLER METAL - Metal added to the weld.

FILLET WELD - A weld approximately triangular in shape joining two surfaces approximately at right angles to each other in a lap joint, tee joint or corner joint.

FIXTURE - A device for holding work in position or alignment while it is being welded.

FLAT POSITION - Set up where welding is performed from upper side of joint and face of weld is approximately horizontal. Sometimes called DOWNHAND WELDING.

FLUX - Fusible material used in brazing and welding to dissolve and facilitate removal or oxides and other undesirable substances.

FUSION ZONE - Area of base metal melted as determined by inspecting cross-section of a weld.

GROOVE WELD - A weld made in groove between two members to be joined.

HARDENING - Heating and quenching of certain iron base alloys to produce a hardness superior to that of untreated material.

HORIZONTAL POSITION - Set up where the weld is made in a horizontal plane and against an approximately vertical surface.

INCOMPLETE FUSION - A weld in which there are voids between mating parts.

INTERMITTENT WELDING - Pattern of welding where the continuity of the run is broken by unwelded spaces.

LAP JOINT - A joint between two overlapping metal pieces.

LAYOUT - To locate and scribe points for machining or forming operations.

LEG OF A FILLET WELD - Distance from root of joint to toe of fillet weld.

MALLEABILITY - Property of metal that determines ease with which it can be shaped when subjected to mechanical working (forging, rolling, etc.).

OVERHEAD POSITION - Set up where welding is performed from the underside of the joint.

OVERLAP - Protrustion of weld metal beyond bond at toe of weld.

PASS - A single welding operation along a joint or weld deposit. A weld bead results.

PENETRATION - Distance the fusion zone extends below surface of part or parts being welded.

POROSITY - Gas pockets or voids in the metal.

PUDDLE - Portion of weld that is molten at place where heat is applied.

REVERSED POLARITY - Arrangement of arc welding leads where the work is negative pole and electrode is positive pole of arc circuit.

ROOT OF WELD - Points at which bottom of weld intersects base metal surfaces.

ROOT OPENING - Spacing or separation between metal members to be joined at the root of the joint.

SLAG INCLUSION - Nonmetallic solid material entrapped in weld metal or between weld metal and base metal.

SPATTER - Metal particles expelled during arc or gas welding which do not form a part of the weld.

STANDARD - An accepted base for a uniform system of measurement and quality.

STRING BEAD - Type of weld bead made without a weaving motion.

STRINGER BEAD - The initial bead, same as ROOT PASS.

TACK WELD - A weld (generally short) made to hold parts in proper alignment until final welds are made. Used for assembly purposes only.

UNDERCUT - A groove melted into base metal adjacent to toe of weld and left unfilled by weld metal.

UPHILL-WELDING - A pipe welding term indicating that welds are made from bottom of pipe to top of pipe. The pipe is not rotated.

VERTICAL POSITION - Set up for welding where the axis of the weld is approximately vertical.

WEAVING - A technique of depositing metal in which the electrode is moved in an oscillating motion.

WELDING MACHINE - Equipment used to perform welding operation.

WHIPPING - An inward movement of the electrode generally employed in vertical welding to avoid undercut.

Addendum to Task 5.01

STANDARD FOR EVALUATION OF COMPETENCIES

ARC WELDING

AREA OF EVALUATION	WHAT TO LOOK FOR
1. Size of welds	
a. Stringer beads	Height and width
b. Fillet welds	Size of legs, contour of weld face
2. Starting a weld	Height and width same as rest of weld
3. Uniform flux lines	Even spacing and round shape
4. Tie-ins	Restarting a weld in a crater
5. End of weld	Proper filling of a crater at the end of the weld
6. Undercut	Groove at toes of weld
7. Excessive spatter	Small balls of metal and slag around weld area
8. Dirty welds	Improper cleaning during the after welding

TASK 5.02 SAFETY IN ARC WELDING

PERFORMANCE OBJECTIVE:

Given instruction concerning arc welding safety, demonstrate safety precautions recommended by the instructor and text (industry standards) concerning the handling of hot metal, high current electricity, toxic fumes, large quantities of ultraviolet rays, droplets of molten metals, and proper setting of arc welding machines.

PERFORMANCE ACTIONS:

5.0201 Identify personal safety clothing and equipment:

- a. Describe personal clothing recommendations: High-top leather shoes with safety tips recommended and no canvas shoes, no cuffs in trousers and shirts without pockets recommended.
- b. Identify proper safety clothing and equipment to include: Head Shield (welding helmet) or hand shield, proper lenses for ultraviolet and infrared rays and proper care of lenses, gauntlet type gloves, leather (or fire resistent) jacket, apron, or sleeves.

5.0202

- a. Use tongs or pliers to handle hot metal.
- b. Cool hot metal in a quench tank or safe cooling area.

5.0203 Do not carry easily ignited materials such as butane lighters, matches, etc.

5.0204 Check welding area for proper ventilation.

5.0205 Check welding area to ensure the safety of others. Check to ensure safe housekeeping.

5.0206 Check to ensure the equipment and accessories are safe before starting.

PERFORMANCE STANDARDS:

- Demonstrate by written knowledge test and performance in training situations, proper safety precautions for arc welding, meeting the instructor's standards and standards accepted by the welding industry.
- "Zero" reportable injuries.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Proper care with flammable material around welding shop.
- Take care in damp or wet areas.
- Proper care in welding a tank or container, especially if it has contained flammable material in the past.

SAFETY IN ARC WELDING

The following "safety cautions" are quoted directly from the following publication and are recommended as a safety standard in arc welding training.

Giachino, Joseph W., Weeks, William. Welding Skills and Practices, Chicago, IL: American Technical Publishers, Inc., pp. 14-17, 1976.

1. "Install welding equipment according to provisions of the National Electric Code.

2. "Be sure a welding machine is equipped with a power disconnect switch which is conveniently located at or near the machine so the power can be shut off quickly.

3. "Don't make repairs to welding equipment unless the power to the machine is shut OFF.

4. "Don't use welding machines without proper grounding. Do not ground to pipelines carrying gases or flammable liquids.

5. "Don't use electrode holders with loose cable connectors. Keep connections tight at all times. Avoid using electrode holders with defective jaws or poor insulation.

6. "Don't change the polarity switch when the machine is under a load. Wait until the machine idles and the circuit is open.

7. "Don't operate the range switch under load. The range switch which provides the current setting should be operated only while the machine is idling and the current is open.

8. "Don't overload welding cables or operate a machine with poor connections.

9. "Don't weld in damp areas and keep hands and clothing dry at all times. Dampness on the body may cause an electric shock. Never stand or lie in puddles of water, on damp ground, or against grounded metal when welding without suitable insulation. Use a dry board or rubber mat to stand on.

10. "Don't strike an arc if someone without proper eye protection is nearby. Arc rays are harmful to the eyes and skin. If other persons must work nearby, the welding area should be partitioned off with a fire-retardant canvas to protect them from the arc welding flash.

11. "Never pick up pieces of metal which have just been welded or heated.

12. "Always wear protective eye goggles when chipping or grinding.

13. "Don't weld on hollow (cored) casting unless they have been properly vented, otherwise an explosion may occur.

14. "Be sure press-type welding machines are effectively guarded.

15. "Be sure suitable spark shields are used around equipment in flash welding.

16. "When welding is completed, turn OFF the machine. If applicable, pull the power disconnect switch. Hand the electrode holder in its designated place."

TASK 5.03 MACHINES AND ACCESSORIES

PERFORMANCE OBJECTIVE:

Given instruction concerning machines and accessories for arc welding, demonstrate the proper procedures to set up given shielded metallic arc (ARC) welding equipment to the instructor's standards (standards of industry or manufacturer).

PERFORMANCE ACTIONS:

5.0301 Identify basic types of arc welding machines:

- a. (1) AC
    - (2) DC
    - (3) AC/DC Rectifier
- b. Interpret advantages/uses of each type.

5.0302 Locate major controls on different machines in training lab.

5.0303 Identify arc welding equipment accessories:

- a. Cables
- b. Ground clamp
- c. Electrode holder
- d. Electrodes
- e. Welding shield or helmet
- f. Personal safety clothing
- g. Hot metal handling tools
- h. Weld cleaning equipment

5.0304 Demonstrate proper procedures for setting up arc welding equipment.

PERFORMANCE STANDARDS:

- Set up arc welding equipment according to instructor's guidelines according to the type of welding to be done.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Safety precautions in operating machines.
- Manufacturer's instructions.

Addendum to Task 5.03

ARC WELDING EQUIPMENT

CHECKLIST

Check each item prior to starting any welding assignment. (The checklist may be used by the student or instructor.)

		Yes	No
1.	Machine is properly grounded.	( )	( )
2.	Cable ground clamp is properly secured.	( )	( )
3.	Main power switch is turned on for welding.	( )	( )
4.	The machine, of a motor generator, is set for correct polarity.	( )	( )
5.	The amperage control is set at the approximate current for the electrode to be used.	( )	( )
6.	The electrode holder is in good condition.	( )	( )
7.	The bench top is clean and dry.	( )	( )
8.	Welding gloves are available for use.	( )	( )
9.	Trainee is wearing proper protective clothing for welding.	( )	( )
10.	Clear cover glasses over the helmet lens are relatively free of metal spatter.	( )	( )
11.	The welding area is properly shielded.	( )	( )
12.	There is ample ventilation.	( )	( )
13.	Slag removal equipment is available.	( )	( )

Source: Giachino, Joseph W. Arc Welding, Alsip, IL: American Technical Publishers, Inc., 1977.

TASK 5.04 SELECT ELECTRODE

PERFORMANCE OBJECTIVE:

Given an orientation to arc welding electrodes, select electrode and describe how to properly store and conserve electrodes during training.

PERFORMANCE ACTIONS:

5.0401	Describe the actions of electrodes in arc welding.
5.0402	Identify arc welding electrodes given by instructor.
5.0403	Explain how to properly store electrodes.
5.0404	Describe how to conserve electrodes in training.
5.0405	Demonstrate proper selection of electrodes for given welding jobs.

PERFORMANCE STANDARDS:

- Describe how to properly store electrodes and how to conserve electrodes in training.
- Demonstrate proper selection of electrodes, storage, and conservation.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 5.0 B — ARC WELDING

TASK 5.05 — STRIKING AND MAINTAINING (SUBSTAINING) AN ARC (FLAT POSITION)

PERFORMANCE OBJECTIVE:

Given instruction, safety protective equipment, welding machine-equipment-accessories, and electrodes, and angle iron or frame channel; strike and maintain an arc to the instructor's standards.

PERFORMANCE ACTIONS:

5.0501 Prepare for welding. (Take safety precautions.)

5.0502 Set up given arc machine-equipment-accessories.

5.0503 Position metal.

5.0504 Correctly position electrode in holder and grip holder for welding.

5.0505
- a. Strike and maintain an arc. (Use scratch, tapping, etc., method to produce acceptable arc.)
- b. Adjust for proper heat.

PERFORMANCE STANDARDS:

- Strike and maintain an arc to the instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Operation of arc machine-equipment-accessories.
- Safety precautions.
- Electrode identification.

Addendum to Task 5.05

WELD ANALYSIS

CHECKLIST

	Yes	No
1. Bead width are right size.	☐	☐
2. Beads have uniform ripples.	☐	☐
3. Weld beads are too flat.	☐	☐
4. Weld beads are too high.	☐	☐
5. Weld penetration is insufficient.	☐	☐
6. Weld penetration is excessive.	☐	☐
7. Cold laps on surface.	☐	☐
8. Weld has surface porosity.	☐	☐
9. Weld has subsurface porosity.	☐	☐
10. Weld has crater cracks.	☐	☐
11. Weld has burn thru.	☐	☐
12. End crater is filled.	☐	☐
13. Weld passed bend test without cracking.	☐	☐

Source: Giachino, Joseph W. Arc Welding, Alsip, IL:
American Technical Publishers, Inc., 1977.

TASK 5.06 CHIP SLAG USING CHIPPING HAMMER

PERFORMANCE OBJECTIVE:

Given a welded joint and chipping hammer; remove slag from weld. Weldment must be free of all removable slag.

PERFORMANCE ACTIONS:

5.0601 Prepare for chipping: Select safety equipment.

5.0602 Select chipping hammer.

5.0603 Chip slag from weld using side by side method.

5.0604 Brush to clean as required.

PERFORMANCE STANDARDS:

- Chip slag from freshly cooled weld so that all removable slag is freed.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Clean weld area thoroughly of all paint, scale, rust, etc.
- Uncleaned weld area is the common cause of slag.

UNIT 5.0 B ARC WELDING

TASK 5.07 RUN SHORT BEADS, FLAT POSITION (TRAINING TASK)

PERFORMANCE OBJECTIVE:

Given instructions, arc welding machine, safety equipment, accessories, mild steel plate, and electrode; run short beads to the instructor's standards. Flat position.

PERFORMANCE ACTIONS:

5.0701 Prepare for arc welding (including safety precautions).

5.0702 Set up arc machine-equipment-accessories.

5.0703 Position plate.

5.0704
- a. Run short beads in flat position to instructor's standards. (Scratch method recommended).
- b. Examine weld bead (after each pass).
- c. Adjust machine as necessary to produce a satisfactory bead.

5.0705 Clean weld after each pass.

PERFORMANCE STANDARDS:

- Run short beads to instructor's standards.
- Beads must be straight, with no undercut, no slag inclusions or porosity.
- Even ripple appearance.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Recognizing the sound of an arc that is:
  - a. correct (continuous cracking, frying)
  - b. too long (humming)
  - c. or too short (popping)
- Identify desired puddle appearance.
- Check adjustment of welding heat.

UNIT 5.0 B ARC WELDING

TASK 5.08 RUN CONTINUOUS BEADS, FLAT POSITION (TRAINING TASK)

PERFORMANCE OBJECTIVE:

Given instructions, arc welding machine-equipment-accessories (including safety clothing), electrode and metal plate; run continuous beads to the instructor's standards.

PERFORMANCE ACTIONS:

5.0801 Prepare for arc welding. (Machine safety equipment, accessories, personal safety, etc.)

5.0802 Mark lines on steel plate and position plate for welding.

5.0803 Run a continuous bead, starting at left edge of work, using the full length of the electrode.

5.0804
a. Remove slag.
b. Examine weld.
c. Adjust machine if necessary.

Suggested: At end of weld, stop bead by shortening arc and quickly backing or "whipping" electrode to break the arc.

(NOTE: Running a continuous bead will be repetitive process until the student becomes competent in the task.)

ADDITIONAL SKILL DEVELOPMENT TASKS IN RUNNING BEADS

1. Practice re-striking the arc while running continuous beads.
2. Practice padding.

PERFORMANCE STANDARDS:

- Run a continuous bead on given metal plate to the instructor's standards.
- Even ripple appearance.
- No undercut, porosity, slag inclusions.
- Proper penetration.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Proper use of electrode in striking the arc.

UNIT 5.0 B ARC WELDING

TASK 5.09 PREPARE JOINT

PERFORMANCE OBJECTIVE:

(See related tasks in Oxyacetylene Welding) Given metal to clean and prepare for welding, select the best joint and prepare the joint for arc welding.

PERFORMANCE ACTIONS:

5.0901 Select type of joint. (It should be simplest joint to adequately do the job.)

5.0902 Prepare the joint so that the weld may penetrate close to 100 percent (deep penetration).

5.0903 a. Square butt.
b. Single bevel groove.
c. Single V groove.

5.0904 Clean and dry joints for welding.

PERFORMANCE STANDARDS:

- Prepare joints for welding meeting instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Review related tasks in Oxyacetylene Welding, as necessary.
- Metal characteristics.

UNIT 5.0 B ARC WELDING

TASK 5.10 (Optional) CONSTRUCT OPEN BUTT WELD, ALL POSITIONS

PERFORMANCE OBJECTIVE:

Given a shielded metal arc welding station, mild steel coupons, electrodes, personal safety equipment, and the necessary tools and materials, construct open butt welds, 1/16 inch root opening, in all positions (flat, horizontal, vertical, and overhead). Bead must be straight and uniform in height and width; have no oxidation, weld must be fused with base metal and have full penetration.

PERFORMANCE ACTIONS:

5.1001	Prepare for ARC welding; select safety equipment.
5.1002	Set up SMAW machine, equipment, and supplies, and overhead fixture (jig) as applicable.
5.1003	Clean and position plate in proper configuration and position.
5.1004	Tack weld plates into position.
5.1005	Construct open butt weld, all positions, to specifications.

PERFORMANCE STANDARDS:

- Construct open butt weld, all positions, to specifications, so that the bead is straight and uniform in height and width, there is no oxidation, the weld is fused with base metal, and there is full penetration.
- The instructor's standards must be met.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 5.0 B ARC WELDING

TASK 5.11 CONSTRUCT LAP JOINT WELD, 3/8 INCH EQUAL LEGS, THREE PASSES

PERFORMANCE OBJECTIVE:

Given a shielded metal arc welding station, mild steel coupons, electrode, personal safety equipment, and the necessary tools and materials; construct a three pass lap joint weld, 3/8 inch equal legs. Beads must be straight and uniform in height and width; have a uniform ripple formation; and have no undercut, porosity, craters, or oxidation. Weld must be fused with base metal and show no visible penetration on opposite side of weld.

PERFORMANCE ACTIONS:

5.1101	Prepare for ARC welding.
5.1102	Set up SMAW machine, equipment, and supplies, and (jig), as applicable.
5.1103	Clean and position plate in proper configuration, position.
5.1104	Tack weld.
5.1105	Make multiple passes to weld lap joint as specified.

PERFORMANCE STANDARDS:

- Construct lap joint weld, 3/8 inch equal legs, three passes.
- Beads must be straight and uniform in height and width; have a uniform ripple formation; and have no undercut, porosity, craters, or oxidation.
- Weld must be fused with base metal and show no visible penetration on opposite side of weld.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

CHECKLIST FOR SMAW WELDS

CHECK TO INDICATE THAT THE STUDENT HAS COMPLETED THE WELD TO INDUSTRY STANDARDS (Omit otherwise)

	FLAT		HORIZONTAL		VERTICAL	
	Butt	Lap	Butt	Lap	Butt	Lap
1. Even bead.						
2. Even ripple in bead.						
3. Bead uniform in width.						
4. Bead height not excessive.						
5. No holes in weld.						
6. Weld not brittle.						
7. No excessive metal under joint.						
8. Proper penetration.						
9. No cracks.						
10. End crater filled.						
11. No cold overlaps along joint seam.						
12. Good fusion.						
13. No undercutting.						
14. No porosity.						

Module 5.0 - Unit 5.0 B

STUDENT: ______________________________ DATE: _____________

1. Two basic types of electric welding are _____.

_____ a. oxygen and acetylene
b. brazing and soldering
c. heating and cutting
d. arc and spot

2. Arc welding is a welding process that uses _____.

_____ a. gas power
b. air power
c. electric current
d. electrode power

3. An arc is created where there is a break in the circuit and the electricity _____.

_____ a. flows straight through
b. detours around the break
c. stops at the break
d. jumps over the break

4. The electrode in arc welding is used as _____.

_____ a. conductor
b. insulator
c. filler rod
d. gaseous shield

5. Resistance spot welding can only be used to

_____ a. butt weld
b. overhead weld
c. vertical weld
d. lapp weld

6. When welding light weight, high strength automotive metal, the preferred process is _____.

_____ a. a MIG welder
b. an oxy-acetylene welder
c. a resistance welder
d. a TIG welder

UNIT 5.0 C

GAS METAL ARC WELDING (GMAW) [MIG]

GAS METAL ARC WELDING (MIG)

Suggested Terminology

GAS METAL ARC WELDING (GMAW) (MIG) - Arc welding process in which consumable base electrode is fed into weld joint at a controlled rate while a continuous blanket of inert or other gas shields the weld zone from contamination by the atmosphere.

ARC LENGTH (WELDING VOLTAGES) - Heat generated by flow of current through the gap between the end of the wire and the workpiece. Voltage appears across the gap and varies in the same direction as the length of the arc.

FERROUS - Any metal containing iron such as mild steel or stainless steel.

FLOWMETER - Device used with regulator to measure amount of gas around the arc (measuring the amount of gas coming out the nozzle rather than the pressure of the gas). Calibrated in cubic feet per hour (cfh), the flowmeter is dependent on the regulator delivering constant outlet pressure to the flowmeter of approximately 50 psig.

GMAW WELDING CURRENT (AMPERAGE) - Usually direct current (DC) reverse polarity (RP), or DCRP, is used in MIG with the welding wire positive (+) and the work negative (-).

GUN (GMAW) - In this instruction guide, a hand held device used to transfer current and guide the electrode into the arc. It will include provisions for shielding and arc initiation.

INERT GAS - A gas which typically does not combine chemically with the base metal or filler metal. Used to create a protective atmosphere.

NON-FERROUS - Any metal that contains no iron such as aluminum.

NOZZLE - Part of the gun used to direct shielding gas.

PULL (DRAG) (electrode) - Electrode is pointing away from direction of travel. (Pulling, backhand are other terms.)

PUSH (electrode) - Electrode is pointing in direction of travel. (Pushing, forehand are other terms.)

REGULATOR - Device for controlling delivery of gas at some substantially constant pressure regarding variation in the higher pressure at the source.

SHIELDED GAS - Inert or other gas(es) used to display air around arc to prevent contamination by oxygen, nitrogen, or hydrogen from the atomosphere.

SHORT CIRCUIT TRANSFER (SHORT ARC) - GMAW process where low currents, low voltages, and small diameter wires are used to weld on thin to heavy metals, all positions.

SPLATTER- Metal particles expelled during welding and which do not form a part of the weld.

SPOOL - Filler metal in a continuous length of electrode wound on cylinder.

SPRAY TRANSFER (SPRAY ARC) - GMAW process usually used with thicker metal using larger diameter wires and a shielded gas mixture of argon with 1-5 percent oxygen and done in the flat and horizontal positions only.

STICK OUT - Distance from end of electrode to contact tip of gun.

WHISKERS - Short lengths of welding wire that feed through the root gap of a grooved joint and extend out from the root of the weld in all directions.

AUTO BODY
GAS METAL ARC WELDING (GMAW) [MIG]
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 5.0 C	GAS METAL ARC WELDING (GMAW) [MIG]	
5.01	Introduction to GMAW (MIG) Welding	*
5.02	GMAW Welding Safety	*
5.03	Set Up and Shut Down GMAW (MIG) Equipment	*
5.04	Maintain Gas Metal Arc Welding Gun (Torch)	*
5.05	Weld Stringer Beads With GMAW Equipment, Flat Position	*
5.06	Weld Sheet Metal by Mig Process	*
	TOTAL	30

*Integrated training

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Unit 5.0 C	GAS METAL ARC WELDING (GMAW) [MIG]
5.01	(Introduction to GMAW [MIG] Welding) Given instruction, describe the operation of the Gas Metal Arc Welding (GMAW) (MIG) process, type of equipment used, and application of the process on newer auto body models.
5.02	(GMAW Welding Safety) Given instructions concerning welding safety using the GMAW process, demonstrate the proper safety precautions when preparing for and using MIG welding. Meet the instructor's standards.
5.03	(Set Up and Shut Down GMAW [MIG] Equipment) Given a GMAW (MIG) machine, 75/25 cylinder, flowmeter and materials; set up the unit for welding. After setting up the unit, shut down the unit completely meeting the instructor's specifications and standards.
5.04	(Maintain Gas Metal Arc Welding Gun [Torch]) Given GMAW (MIG) equipment, proper tools and supplies for maintenance, and instructions; maintain GMAW gun (torch) and wire feed system in proper operating condition. The instructor's standards must be met.
5.05	(Weld Stringer Beads With GMAW Equipment, Flat Position) Given MIG unit, accessories and supplies, scrap sheet metal, and welding specifications; weld stringer beads on metal. Visual inspection will show: - smooth and continuous welds - even ripple - complete fusion and uniform restarts - no porosity holes or protrusion
5.06	(Weld Sheet Metal by Mig Process) Given a MIG unit, panels, equipment, supplies, and specifications; weld the metal together as specified. Weld should have been ripple spacing, no undercutting on vertical member, complete crater fill at end of weld, no overlap, and leg size on fillet welds equal or close to being equal.

UNIT 5.0 C GMAW (MIG)

TASK 5.01 INTRODUCTION TO GMAW (MIG) WELDING

PERFORMANCE OBJECTIVE:

Given instruction, describe the operation of the Gas Metal Arc Welding (GMAW) (MIG) process, type of equipment used, and application of the process on newer auto body models.

PERFORMANCE ACTIONS:

5.0101 Identify advantages of GMAW (MIG) process compared to ARC (SMAW) or Oxy-fuel (OAW) welding.

5.0102 Identify/select typical equipment used for MIG welding:

a. Describe shielded gas.
b. Describe type of torch.
c. Describe electrode wire feed system.

5.0103 Describe GMAW (MIG) process.

PERFORMANCE STANDARDS:

- Describe method of operation of GMAW welding, the type of equipment needed, and typical applications of MIG welding.
- The instructor's standards apply and the student must demonstrate an understanding appropriate for entry level employment using the GMAW process.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- At conclusion of MIG training, student should be able to use or identify the related terminology.

UNIT 5.0 C GMAW (MIG)

TASK 5.02 GMAW WELDING SAFETY

PERFORMANCE OBJECTIVE:

Given instructions concerning welding safety using the GMAW process, demonstrate the proper safety precautions when preparing for and using MIG welding. Meet the instructor's standards.

PERFORMANCE ACTIONS:

5.0201 Review safety precautions concerning:

a. Electric shock
b. Arc radiation
c. Air contamination
d. Fire and explosion
e. Compressed gases
f. Welding cleaning
g. Other hazards

(NOTE: All safety precautions for ARC welding apply.)

5.0202 Lenses for helmet should be selected depending intensity of arc.

(NOTE: Because of the clearer atmosphere around the GMAW arc, a darker shade of helmet lens must be used to reduce eye fatigue and possible eye damage. It is important that the clear cover glass, a proper filter lens, and sometimes a clear cover lens be used. Lenses should be clean. Flash goggles of approximately #2 shade should be worn under the helmet.)

5.0203 Protective clothing must be worn.

5.0204 Review safety recommendations of the GMAW equipment manufacturer.

PERFORMANCE STANDARDS:

- Demonstrate safety behavior using GMAW equipment to the instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

TASK 5.03 SET UP AND SHUT DOWN GMAW (MIG) EQUIPMENT

PERFORMANCE OBJECTIVE:

Given a GMAW (MIG) machine, 75/25 cylinder, flowmeter and materials; set up the unit for welding. After setting up the unit, shut down the unit completely meeting the instructor's specifications and standards.

PERFORMANCE ACTIONS:

5.0301 Select safety equipment.

5.0302 Preliminary check for MIG welding:

a. Check that electrical power controls are in OFF position.
b. Inspect to be sure hose and cable connections from gun (torch) to feeder are in good condition, properly insulated, and that connections are correctly made.
c. Be sure the nozzle is correct for the wire diameter used.
d. Inspect to be sure the wire is threaded properly through the gun.
e. Be sure the apertures of the contact tube and nozzle are clean. (Blow out the gun as necessary to dislodge dust.)
f. Check to see that the wire speed and feed have been predetermined and adjusted on the feeder control.
g. Turn on the shielded gas and adjust for desired output.
h. Be sure wire stick-out is correct.
i. Be sure contact tip is in proper shape. Replace if necessary.

5.0303 Start MIG equipment:

a. Press start switch on welding machine.
b. Place wire feeder switch to ON position.
c. Set wire feed speed control at midway point (thickness of base metal).
(NOTE: Wire speed determines welding current. Adjust speed for type of welding.)
d. Open gas cylinder valve and adjust flowmeter to recommended gas flow rate. (While opening flowmeter valve slowly, lightly squeeze gun trigger momentarily.)

PERFORMANCE ACTIONS (Con't.):

e. Set voltage rheostat to recommended position for thickness of metal to be welded.
(NOTE: Voltage and wire feed must be set while welding. Suggestion: Use scrap material to set controls.)

5.0304 Stop MIG equipment:

a. Close gas outlet valve on top of cylinder.
b. Close gas flowmeter valve.
c. Turn wire feeder to OFF position.
d. Squeeze gun trigger to bleed lines.
e. Turn off welding machine.
f. Store gun and cable assembly.

5.0305 When the welding station is shut down, all controls should be returned to zero. At the start of each project, the controls will have to be adjusted for correct operation.

PERFORMANCE STANDARDS:

- Properly set up a GMAW (MIG) welding unit and shut down the equipment completely.
- Manufacturer's instruction book or specifications must be met if applicable.
- Instructor's standards must be met.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

SEE ACCOMPANYING CHECKLIST

CHECKLIST

SET UP AND SHUT DOWN MIG EQUIPMENT

(Check only if performance is acceptable.)

( ) 1. All power controls are off.

( ) 2. Cable and hose connections are secure.

( ) 3. There are no visible breaks in cable insulation.

( ) 4. The gun has the right nozzle for the diameter wire.

( ) 5. Wire is threaded correctly through the gun.

( ) 6. Nozzle is clean and free of obstructions.

( ) 7. Wire feed is set.

( ) 8. Shielded gas flow is set.

( ) 9. Wire stick-out is correct.

( ) 10. Contact tip of gun is in good shape.

( ) 11. Voltage control is set correctly.

( ) 12. Adequate ventilation is provided for welding.

( ) 13. Gloves and helmet are available and used.

( ) 14. Clothing for welding is appropriate, safe.

UNIT 5.0 C GMAW (MIG)

TASK 5.04 (Orientation) MAINTAIN GAS METAL ARC WELDING GUN (TORCH)

PERFORMANCE OBJECTIVE:

Given GMAW (MIG) equipment, proper tools and supplies for maintenance, and instructions; maintain GMAW gun (torch) and wire feed system in proper operating condition. The instructor's standards must be met.

PERFORMANCE ACTIONS:

5.0401 (Wire spool type station) Keep wire on spool clean. Keep spool covered except when replacing it.

5.0402 Inspect to be sure spool moves freely on shaft.

5.0403 Inspect to be sure wire does not have any sharp bends or kinks.

5.0404 Clean wire feed rollers each time a new spool of wire is installed.

5.0405 Lightly lubricate wire before wire enters rollers.

5.0406 Inspect to be sure welding cable is as straight as possible to improve wire feed.

5.0407 Inspect to be sure feed rolls are in line with each other and in line with inlet and outlet bushing.

5.0408 Be sure that the welding machine is electrically grounded. Be sure area where ground is attached is clean.

5.0409 Be sure that the ground clamp surface is clean.

5.0410 Keep the gun or torch nozzle as clean and as free from metal splatter as possible. Remove spatter. Clean inside and outside of tube through which electrode wire passes, each time electrode reel is changed.

TASK 5.04 (Orientation) MAINTAIN GAS METAL ARC WELDING GUN (TORCH) (Con't.)

PERFORMANCE STANDARDS:

- Maintain MIG welding equipment (gun or torch) in proper operating condition.
- Meet instructor's standards.
- Follow manufacturer's instruction manual.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Manufacturer's instruction manual.

UNIT 5.0 C — GMAW (MIG)

TASK 5.05 — WELD STRINGER BEADS WITH GMAW EQUIPMENT, FLAT POSITION

PERFORMANCE OBJECTIVE:

Given MIG unit, accessories and supplies, scrap sheet metal, and welding specifications; weld stringer beads on metal. Visual inspection will show:

- smooth and continuous welds
- even ripple
- uniform width and straight
- complete fusion and uniform restarts
- no porosity holes or protrusion

PERFORMANCE ACTIONS:

5.0501 Select safety equipment and accessories for MIG welding.

5.0502 Position metal to weld.

5.0503 Set up MIG equipment. Check equipment.

5.0504 Adjust shielded gas flow rate, voltage, and wire feed speed (amperage) (on scrap metal).

5.0505 Run stringer beads on flat metal with MIG process.

5.0506 Inspect weld(s).

PERFORMANCE STANDARDS:

- Weld stringer beads on flat sheet metal with MIG equipment so that the welds are smooth and continuous, there is even ripple, uniform width and straight welds, so there is complete fusion and uniform restarts, and no porosity holes, or protrusions.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 5.0 C GMAW (MIG)

TASK 5.06 WELD SHEET METAL BY MIG PROCESS

PERFORMANCE OBJECTIVE:

Given a MIG unit, panels, equipment, supplies, and specifications; weld the metal together as specified. Weld should have been ripple spacing, no undercutting on vertical member, complete crater fill at end of weld, no overlap, and leg size on fillet welds equal or close to being equal.

PERFORMANCE ACTIONS:

5.0601 Set up for MIG welding.

5.0602 Tack weld metal into joint position.

5.0603 Inspect position of metal; correct as necessary.

5.0604 Weld to correct alignment of panel, conform maintained using MIG process.

5.0605 Inspect weld quality.

PERFORMANCE STANDARDS:

- Join thin gauge steel using MIG welding process in position as required by instructor and to instructor's specifications.
- Visual inspection of weld should show: Even ripple spacing, no undercutting, complete craterfill at end of weld, no overlap, little or no change in bead height or width.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

CHECKLIST

GMAW (MIG) WELDING

Check to indicate student has mastered weld to standards expected of entry level employee in typical auto body shop. If student does not meet minimum standards, mark an "X" in block.

MIG WELDING TASKS STANDARDS	Mild Steel	Thin Gauge Practice Panel	*Late Model Thin Steel Auto Body
1. Bead width are right size.			
2. Beads have uniform ripples.			
3. Weld beads not too flat (proper width).			
4. Weld beads not too high (proper width).			
5. Weld penetration is sufficient.			
6. No cold laps on surface.			
7. No surface porosity on welds.			
8. No subsurface porosity.			
9. No crater cracks.			
10. No burn thru.			
11. End crater is filled.			
12. Weld passed instructor's inspection.			
13. Joints properly filled and finished.			
14. New panel conforms to original contours of body.			

*Indicates live welding on actual vehicles.

(NOTE: Items 13 and 14 apply to welding of body panels.)

Module 5.0 - Unit 5.0 C

STUDENT: ________________________________ DATE: ____________

1. Identify which welding process uses a continuously consumable wire electrode.

____ a. MIG
b. Oxy-acetylene
c. TIG
d. ARC

2. Identify the shielding gas mixtures used in the short ARC and MIG welding.

____ a. 25 percent He and 75 percent argon
b. 25 percent carbon dioxide, 74 percent argon
c. 25 percent oxygen, 75 percent argon
d. 25 percent argon and 75 percent He

3. Indicate the proper type of anti-splatter compound used in MIG gun nozzles to eleminate spatter.

___ a. flux
b. grease
c. water
d. tip dip or anti-spatter spray

4. List three things that will cause improper gas coverage during MIG welding.

1. ________________
2. ________________
3. ________________

5. List eight items that must be checked before beginning to MIG weld.

1. ________________
2. ________________
3. ________________
4. ________________
5. ________________
6. ________________
7. ________________
8. ________________

6. What three items should be checked before operating the MIG machine?

   1. ______________
   2. ______________
   3. ______________

7. Explain what excessive voltage will cause in MIG welding.

   ____
   ____
   ____

8. Explain what will happen if the nozzle of the MIG gun is filled with metal particles.

   ____
   ____
   ____

9. Explain what will happen if the filler wire develops a kink in it while MIG welding.

   ____
   ____
   ____

10. Explain why the spools of MIG wire should remain covered while in use.

   ____
   ____
   ____

UNIT 5.0 D

APPLIED WELDING

AUTO BODY
APPLIED WELDING
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 5.0 D	APPLIED WELDING	
5.01	Weld Vehicle Body Panel	*
5.02	Weld a Scab Patch	*

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*Integrated with Oxyacetylene (OAW) Cutting/Welding and Brazing

MODULE/TASK	DESCRIPTION
Unit 5.0 D	APPLIED WELDING
5.01	(Weld Vehicle Body Panel) Given a vehicle requiring body panel installation (such as rocker panel, roof panel, quarter panel, etc.), welding equipment and tools and materials; weld the given panel to adjacent parts so that no new damage results and so the replaced parts fits properly.
5.02	(Weld a Scab Patch) Given a hole or rusted out spot to repair, a welding unit, metal of same gauge as panel cut as needed, drill and drill bits, sheet metal screws, and filler and necessary tools and materials; install a scab patch so that the finished metal surface is within 1/4 inch of the original surface before plastic filler is applied.

UNIT 5.0 D APPLIED WELDING

TASK 5.01 WELD VEHICLE BODY PANEL

PERFORMANCE OBJECTIVE:

Given a vehicle requiring body panel installation (such as rocker panel, roof panel, quarter panel, etc.), welding equipment and tools and materials; weld the given panel to adjacent parts so that no new damage results and so the replaced parts fits properly.

PERFORMANCE ACTIONS:

5.0101 Inspect vehicle and panel to be replaced.

5.0102 Prepare vehicle and panel for welding.

5.0103 Align panel to fit vehicle properly.

5.0104 As appropriate, attach panel with screws (or spot welds).

5.0105 Check alignment.

5.0106 Weld panel as required.

5.0107 Inspect weld.

PERFORMANCE STANDARDS:

- Weld given vehicle body panel in place as required using proper alignment and welding techniques so that the finished product is correctly positioned.
- Performance process and product must be to instructor's standards.

SUGGESTED INSTRUCTION TIME: 6-18 Hours (See manual for minimum times.)

RELATED TECHNICAL INFORMATION:

- Preparing metal for welding.
- Welding.
- Use of hand tools.
- Use of sheet metal screws for fastening metal.
- Alignment of body panels.

SEE ACCOMPANYING CHECKLIST

CHECKLIST

WELD VEHICLE BODY PANEL	Accept-able	Unaccept-able
1. Replacement panel is aligned properly.		
2. Spot weld to adjacent panels are about 1 inch apart.		
3. Proper welding material used for strength.		
4. Joints are filled and finished properly.		
5. New panel conforms to original contours of vehicle.		

UNIT 5.0 D APPLIED WELDING

TASK 5.02 WELD A SCAB PATCH

PERFORMANCE OBJECTIVE:

Given a hole or rusted out spot to repair, a welding unit, metal of same gauge as panel cut as needed, drill and drill bits, sheet metal screws, filler, and necessary tools and materials; install a scab patch so that the finished metal surface is within 1/4 inch of the original surface before plastic filler is applied.

PERFORMANCE ACTIONS:

5.0201 Determine that a metal scab patch is the best method of repair.

5.0202 Cut and shape the patch to fit.

5.0203 Cut panel damage out as necessary.

5.0204 Grind panel for patch. Grind inside of patch for bonding.

5.0205 Patch to bare metal.

5.0206 Fasten patch to panel with screws.

5.0207 Weld patch with filler rod following procedures outlined by instructor.

5.0208 Prepare metal for plastic filler (metal must be within 1/4 inch of original contour).

(NOTE: In step 3, panel may be cut or by oxy-fuel torch or by other method.)

PERFORMANCE STANDARDS:

- Repair a hole or rust damage by welding a scab patch over the damage so the repaired metal is within 1/4 inch of original contour.

SUGGESTED INSTRUCTION TIME: 1 Hours

RELATED TECHNICAL INFORMATION:

- Oxy-fuel welding.
- ARC welding.
- Grinding.
- Measuring.
- Shaping metal to contour.

SHEET METAL SAFETY

1. Since sheet metal can cause serious cuts, handle it with care. Wear gloves when appropriate.

2. Treat every cut immediately, no matter how minor.

3. Remove all burrs from the metal before attempting to work further on it.

4. Use a brush to clean work area. Never brush metal with hands.

5. Use tools that are sharp.

6. Do not run hands over the surface of sheet metal that has just been cut or drilled. Painful cuts can be received from the burrs.

7. Place removed sheet metal in safe locations out of walkways.

8. Do not use tools that are not in first-class condition... (hammer heads loose on handle, chisels with mushroomed heads, power tools with damaged parts, etc.).

MODULE 6.0

METALWORKING INTRODUCTION

RECOMMENDATION: Welding should be taught as a related program and mastered before starting sheet metal work. Some metalworking tasks will require welding skills that may be taught prior to the development of the metalworking skills or as a related skill when needed.

Units in this module:

UNIT 6.0 A	METALWORKING
UNIT 6.0 B	METALWORKING - BODY FILLERS

The distinguishing characteristic between "Dinging" and "Bumping" is that "Dinging" requires highly skilled use of the hammer, dolly, and spoon so that no damage to the paint will result. The "Dingman" typically will be skilled as a "Metal finisher" whose work may include bumping, filing, grinding and welding surfaces and building up contours with metal or plastic. Typically the term "Dingman" is reserved to automotive plants while the work of the dealer and shop craftsmen are referred to as metal finishing or bumping.

STANDARDS IN AUTO BODY REPAIR

1. Study damage prior to beginning work.
2. Imagine how damage was done.
3. Work panel back to shape slowly.
4. When grinding back old finish, go far enough so that no plastic will be on old finish when you're through.
5. Learn to use your hand to feel irregularities in the damaged area.
6. Don't depend on paint to hide anything. If you can feel irregularities, you will see them when the job is done/ painted.
7. Putty small imperfections in plastic work such as pin holes, scratches, and very minor low spots with smooth quick strokes.
8. Block your glazing putty with the paint paddle and a 220-320 grit sandpaper.
9. Prime lightly, covering all bare spots to prevent rust.

Harman, Robert D., Chilton's Guide to Auto Body Repair and Painting, Radnor, PA: Chilton Book Company, p. 21, 1983.

AUTO BODY
METALWORKING
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 6.0 A	METALWORKING	
6.01	Demonstrate Hammer-on Technique	*
6.02	Demonstrate Hammer-off Technique	*
6.03	Pick, File, and Finish Metal	*
6.04	Pull (Remove) Minor Dents Using Slide-Hammer and Pull Rods	*
6.05	Use Spoon to Remove Dents	*
6.06	Straighten Deformed Auto Body Sheet Metal	*
6.07	Heat Shrink Metal	*
6.08	Cold Shrink Metal	*
	TOTAL	233

*Integrated training

TASK LISTING
AUTO BODY

MODULE/TASK	DESCRIPTION
Unit 6.0 A	METALWORKING
6.01	(Demonstrate Hammer-on Technique) Given a discarded piece of metal and later an auto repair job with a low point in the metal to raise/flatten and the necessary tools, equipment, and materials, as well as appropriate time to practice the skill; demonstrate the hammer-on technique of raising/flattening the metal being struck to the instructor's standards.
6.02	(Demonstrate Hammer-off Technique) Given practice metal and later an automobile with metal damage that requires a low spot to be raised and a high spot driven down with a single hammer blow, and the necessary tools, equipment, and materials; demonstrate the hammer-off technique acceptable to the instructor.
6.03	(Pick, File, and Finish Metal) Given sheet metal with minor dents, the necessary instruction, auto body tools and materials; straighten the damage by using the pick and file method. Finish metal must be prepared for primer surface, must be smooth to the touch and must conform to original contour of body.
6.04	(Pull [Remove] Minor Dents Using Slide-Hammer and Pull Rods) Given an electric drill, assorted pull rods, slide-hammer, sheet metal screws, and a file; restore minor dents in a given panel/sheet metal, inaccessible to pick hammer, so that no imperfections may be felt with the hand.
6.05	(Use Spoon to Remove Dents) Given an assortment of body spoons, hammers and other required tools, and sheet metal to straighten; demonstrate proper method of using spoons; (a) to spread force of hammer blow over large area (dinging/bumping spoon), (b) as a dolly block where access is limited (body spoons), and (c) as a prying or driving tool (heavy-duty body spoons). The sheet metal must be restored to 1/8 inch of its original contour without causing additional damage.
6.06	(Straighten Deformed Auto Body Sheet Metal) Given a vehicle with deformed sheet metal (See addendum page), straighten and align panels. All high and low spots will be removed and all contours will be returned to original shape.

6.07 (Heat Shrink Metal) Given a stretched piece of light gauge sheet metal panel, a hammer and a dolly, oxy-fuel welder, and necessary tools, equipment, and materials; heat shrink the metal panel.

6.08 (Cold Shrink Metal) Given a stretched piece of light gauge sheet metal, a hammer, slapping spoon, a dolly and the necessary tools and materials; cold shrink the metal to the standards of the instructor.

TASK 6.01 DEMONSTRATE HAMMER-ON TECHNIQUE

PERFORMANCE OBJECTIVE:

Given a discarded piece of metal, and later an auto repair job, with a low point in the metal to raise/flatten and the necessary tools, equipment, and materials, as well as an appropriate time to practice the skill; demonstrate the hammer-on technique of raising/flattening the metal being struck to the instructor's standards.

PERFORMANCE ACTIONS:

6.0101 Assemble correct hammer and dolly and other tools, materials, and equipment for the job.

6.0102 Place dolly behind the panel and strike it through the metal with appropriate force.*

6.0103
- a. Practice this skill until the technique is mastered to the point where metal is not unnecessarily damaged, dolly is held in contact with metal and does not "limp wrist" bounce back as the hammer strikes, and so the hammer rebounds from the blow.
- b. Demonstrate hammer-on technique that meets instructor's standards in the repair of auto body damage represented by a low spot in the metal.

*Competency in this skill may require considerable practice during the unit of training or during the two-year period of auto body study.

PERFORMANCE STANDARDS:

- Demonstrate hammer-on dolly technique of metalworking so that the hammer strikes with the appropriate amount of force, bouncing back while the dolly remains in constant contact with the metal.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Tool identification and selection: Hammer with correct profile and dolly conforming to basic curve of panel.

RELATED TECHNICAL INFORMATION (Con't.):

- Technique of hammer-on dolly: Instructor's explanation.
- Metal characteristics.

SKILL DEVELOPMENT:

- Hitting hammer-on dolly: Accuracy, development of right amount of force.

UNIT 6.0 A METALWORKING

TASK 6.02 DEMONSTRATE HAMMER-OFF TECHNIQUE

PERFORMANCE OBJECTIVE:

Given practice metal, and later an automobile, with metal damage that requires a low spot to be raised and a high spot driven down with a single hammer blow, and the necessary tools, equipment, and materials; demonstrate the hammer-off technique acceptable to the instructor.

PERFORMANCE ACTIONS:

6.0201 Identify/select the appropriate hand tools for the metalworking job.

6.0202 Position the dolly and hammer correctly for the hammer-off technique.

6.0203 Demonstrate the hammer-off technique to the instructor's standards:*

a. On given practice metal, strike the damaged area driving down a spot "high" adjacent/above the low spot (about 1/4 inch away) and position the dolly so that the dolly rebounds with the same force as the hammer to drive a low spot up. (Hammer high spot down, dolly low spot up)

(NOTE: Technique should begin with hammer blows on the high metal adjacent to the low spot, never anywhere else.)

b. On a given auto body, repair damage using hammer-off technique to industry standards.

*Competency in this skill may require considerable practice during the unit of training or during the two-year period of auto body study.

PERFORMANCE STANDARDS:

- Demonstrate the hammer-off dolly technique to repair metalwork with both high and low spot damage, using the correct positioning of hammer and dolly and the correct force, meeting instructor and industry standards, and not causing extra damage.

UNIT 6.0 A METALWORKING

TASK 6.02 DEMONSTRATE HAMMER-OFF TECHNIQUE (Con't.)

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Recognize high and low spots of metal damage.
- Hand tool identification and selection (all purpose dolly).
    - Hammer should have correct profile.
    - Dolly should conform to basic curve of panel.

SKILL DEVELOPMENT:

- Technique of hammer blows (force).

TASK 6.03 PICK, FILE, AND FINISH METAL

PERFORMANCE OBJECTIVE:

Given sheet metal with minor dents, the necessary instruction, auto body tools and materials; straighten the damage by using the pick and file method. Finish metal must be prepared for primer surface, must be smooth to the touch and must conform to original contour of body.

*Tools emphasized will be pick hammer, all-purpose dolly, and vixen (flexible) file.

PERFORMANCE ACTIONS:

6.0301 Inspect metal damage.

6.0302 Select proper tools.

6.0303 Determine high or low areas in surface.

6.0304 Use pick hammer to raise low areas.

6.0305 Use metal file to cut down on high spots and imperfections made by pick hammer.

6.0306 Select proper disc grinder and grind out file marks.

6.0307 Featheredge paint and finish in preparation for primer surface.

6.0308 Putty repair scratches as required.

PERFORMANCE STANDARDS:

- On given vehicle or sheet metal with minor dents; pick, file, and finish metal emphasizing use of the pick hammer, all-purpose dolly, and file to remove minor dents.
- The finished panel or metal should have no imperfections that may be felt with the hand.
- Restored panel should be to original contour.
- Performance process and product must be to the instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identification use, and care of hand tools.
- Use of finishing tools such as disc grinder.
- Use of putty.
- Featheredging.
- Making light hammer blows.
- Use of dolly block from underside.
- Safety.
- a. Line filing
  b. Cross filing

UNIT 6.0 A METALWORKING

TASK 6.04 PULL (REMOVE) MINOR DENTS USING SLIDE-HAMMER AND PULL RODS

PERFORMANCE OBJECTIVE:

Given an electric drill, assorted pull rods, slide-hammer, sheet metal screws, and a file; restore minor dents in a given panel/ sheet metal, inaccessible to pick hammer, so that no imperfections may be felt with the hand.

PERFORMANCE ACTIONS:

6.0401 Inspect dent(s) to be removed.

6.0402 Select/assemble pull rods, slide-hammer.

6.0403 Drill required hole in metal at appropriate point.

6.0404 a. Use pull rod to remove shallow dents.
b. Use slide-hammer (dent-puller) to remove minor dents (larger than can be pulled with pull rods).
(NOTE: Decide if punched or drilled hole is most appropriate for job. (Hole punched with awl provides extra contact, lifts wider area, and edges are protected from sander. Drilled holes tend to be lifted high and when ground off and may leave an enlarged hole and thin metal.)

6.0405 Cut down high spots with file. (See related task for soldering, if applicable.)

6.0406 Fill holes and low places and grind to smooth finish, and, if required, prepare for priming.

PERFORMANCE STANDARDS:

- Using the slide-hammer, pull rods, awl, drill, and body file, pull/remove minor dents not accessible to the pick hammer so that the finished metal has no imperfections that can be detected by the hand.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 6.0 A METALWORKING

TASK 6.04 PULL (REMOVE) MINOR DENTS USING SLIDE-HAMMER AND PULL RODS (Con't.)

RELATED TECHNICAL INFORMATION:

- How pull rod functions.
- Use of slide-hammer (dent puller, snatch-hammer).
- Differentiate between advantages of punching and drilling holes.
- Technique of using slide-hammer and pick hammer to pull and level. Avoiding additional damage from use of slide-hammer.
- Technique of using two or more pull rods to pull dents.
- Technique of using picking hammer to work down a raised area around a crease while using pull rods to raise crease.

TASK 6.05 USE SPOON TO REMOVE DENTS

PERFORMANCE OBJECTIVE:

Given an assortment of body spoons, hammers and other required tools, and sheet metal to straighten; demonstrate proper method of using spoons; (a) to spread force of hammer blow over large area (dinging/bumping spoon), (b) as a dolly block where access is limited (body spoons), and (c) as a prying or driving tool (heavy-duty body spoons). The sheet metal must be restored to - 1/8 inch of its original contour without causing additional damage.

PERFORMANCE ACTIONS:

6.0501 Identify dents/damage to be corrected.

6.0502 Determine if the body spoon is the best tool or method of correcting the dent.

6.0503 Assemble body spoons and necessary tools, materials.

6.0504 Demonstrate:

- Use spoons as required by instructor for orientation.

6.0505 Sheet metal must be restored to - 1/8 inch of its original contour without causing additional damage.

PERFORMANCE STANDARDS:

- Use spoons to remove dents as required.
- Restored metal must be to - 1/8 inch of original contour without causing additional damage.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identification of common spoons.
- Use of spoons.
- Technique of using spoons.
- Safety.

UNIT 6.0 A METALWORKING

TASK 6.06 STRAIGTHEN DEFORMED AUTO
BODY SHEET METAL

PERFORMANCE OBJECTIVE:

Given a vehicle with deformed sheet metal (See addendum page), straighten and align panels. All high and low spots will be removed and all contours will be returned to original shape.

See addendum for applied jobs (expanded tasks or objectives).

PERFORMANCE ACTIONS:

6.0601 Inspect damage.

6.0602 Select tools, equipment, and materials.

6.0603 Remove necessary parts.

6.0604 Pull and bump out folds, creases, and dents.

6.0605 Weld torn metal as necessary.

6.0606 Shrink metal if necessary.

6.0607 Line up beads, flanges, and openings as necessary.

6.0608 Check for high and low spots. Fill to contour.

6.0609 Replace trim as necessary.

PERFORMANCE STANDARDS:

- Straighten deformed sheet metal so that panels are straightened and aligned and all high and low spots are removed so that the metal is returned to its original contour and shape.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

NOTE: Addendum accompanies this task as an expansion of skill development.

SUGGESTED COMPETENCY STANDARDS

Advanced students may be assigned to help students with less experience or who have not demonstrated competency. Live projects may be necessary for skill development and training, therefore, may be extended over a period of time rather than concentrated as a specific period during the vocational program.

Emphasis will be on quality workmanship producing a finished product following proper metal working techniques.

SAMPLE EXTENSION TASKS

1. Using no filler, soldering, or drilling; remove a simple and collapsed role buckle from a crowned panel so that the panel is restored to its original contour and is smooth to the hand.

2. Remove a simple hinge buckle from a flat or nearly flat panel so the panel is restored to its original contour and smooth to the hand.

3. Remove a collapsed hinge buckle from a partial box section (i.e., rocker panel) returning it to the original contour and smooth to the touch. Proper techniques of welding. should be demonstrated.

4. Remove a collapsed hinge buckle from a partial box section by the use of pulling equipment and, if required, by the use of heat. The panel should be returned to the original contour and be smooth to the touch.

5. Remove a collapsed hinge buckle from a box section without the use of heat but using pulling equipment. The required section must be returned to its original contour and dimensions.

6. Remove a gouge from a panel using pull rods, slide-hammer, or, if required, through heat. Finished panel must be returned to its original contour and smooth to touch.

7. Repair a tear in a sheet metal panel by welding. All welding beads must be to minimum standards and smooth to the standards of the instructor. No surface will be more than 1/16 inch off original contour. Finished panel must be smooth to the hand.

8. Repair hole or rust damage using a scab patch welded in place without warping metal and within 1/16 inch of the original surface before plastic filler is applied.

9. Repair a hole or rust damaged using a flush patch either by welding, brazing, or with a panel spotter, so that the finished metal is within 1/16 inch of the original contour before plastic filler is applied. No high or low spots must be detectable to the instructor's touch.

10. Given a vehicle containing multiple damages to the sheet metal, straighten the metal to within 1/16 inch of original dimensions and finish with plastic filler so the completed panel is returned to original dimensions and contours. The finished work must meet the standards of the instructor and be eye pleasing to the customer.

TASK 6.07 HEAT SHRINK METAL

PERFORMANCE OBJECTIVE:

Given a stretched piece of light gauge sheet metal panel, a hammer and a dolly, oxy-fuel welder, and necessary tools, equipment, and materials; heat shrink the metal panel.

PERFORMANCE ACTIONS:

6.0701 Determine if heat shrinking is the proper metal working technique.

6.0702 Assemble oxy-fuel equipment, tools, and materials for heat shrinking metal.

6.0703 Prepare metal for heat treating.

6.0704 Light and adjust torch to neutral flame.

6.0705 Heat first spot at center of bulge to cherry-red color.

6.0706 Drive down soften high spot using shrinking hammer.

6.0707 Straighten shrunk area using hammer and dolly. (NOTE: Gouged area may be driven up using dolly or pry tools, etc.)

6.0708 If appropriate (for greater shrinkage of metal), quench hot metal with wet sponge, first being sure the technique will not cause contraction or buckling.

6.0709 Level high and low spots.

6.0710 Finish metal as required.

PERFORMANCE STANDARDS:

- Heat shrink metal using torch, hammer and dolly, and water if recommended so that metal is roughed back to approximate original shape and is ready for finishing.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Oxyacetylene welding.
- Safety.
- Use and care of torch.
- Adjustment of neutral flame.
- Use of hammer and dolly.
- Heat shrinking a bulge.
- Heat shrinking a gouge:
    a. Level low and high spots using hammer-off dolly technique.
    b. Relieve overshrinking using hammer-on dolly technique.

TASK 6.08 (Orientation) COLD SHRINK METAL

PERFORMANCE OBJECTIVE:

Given a stretched piece of light gauge sheet metal, a hammer, slapping spoon, a dolly and the necessary tools and materials; cold shrink the metal to the standards of the instructor.

PERFORMANCE ACTIONS:

COLD SHRINK USING SLAPPING SPOON: (Optional if tool available)

6.0801A Locate stretched area.

6.0802A Assemble tools, etc.

6.0803A Place dolly under lowest point of indentation.

6.0804A Slap panel with slapping spoon using the acceptable technique that will shock the metal and allow it to return to normal position by release and directive.

6.0805A Repeat as necessary.

COLD SHRINK USING HAMMER AND DOLLY:

6.0801B Place shrinking dolly under stretched area.

6.0802B Drive metal down into the concave part of shrinking dolly using hammer. (Cross peen end of shrinking hammer of pick hammer).

6.0803B Draw the stretched area into the dolly to shrink it.

6.0804B Fill depression with plastic filler.

PERFORMANCE STANDARDS:

- Cold shrink given sheet metal using a slapping spoon or the hammer and dolly method so that the metal is shrunk from indentation, etc.
- Process and product must meet instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Use of slapping spoon.
- Use of dolly and hammer.
- Filling (plastic or body lead).

Module 6.0 - Unit 6.0 A

STUDENT: ______________________________ DATE: ____________

1. What is the first thing you do in a repair job?

____ a. rough out
b. metal finishing
c. sheet metal straightening
d. analyzing

2. Off the dolly dinging is to _____.

____ a. hammer on the crease
b. knock up low places
c. hit directly on the dolly with body hammer
d. hit to one side of the dolly with body hammer.

3. Dinging on the dolly is ____.

____ a. holding the dolly under the dent and hammering
b. hitting to one side of the dolly
c. shrinking a high place in metal
d. hammering up a low place

4. The object of repairing a damaged panel is to ____.

____ a. make it look better
b. restore the panel to its original specifications
c. keep it from rusting
d. satisfy the customer

5. Metal straightening is _____.

____ a. an art
b. the most important part of auto body repair
c. very hard to learn
d. very easy to learn

6. Elasticity of metal means the _____.

____ a. metal cannot spring back to its original shape
b. metal will break at point of break
c. metal will become work hardened at point of bend
d. metal will regain its original shape after being bent

7. To remove dents in metal, the low spots have to be lifted up and _____.

____ a. the high spots have to be worked down
b. the flanges are lined up
c. broken places are welded
d. putty is applied

8. The following tool typically is used to repair a dent in metal.

____ a. panel flanger
b. air wrench
c. dolly
d. stretch clamps

9. When doing metal repairs, _____.

____ a. no two jobs are the same
b. all jobs work the same way
c. always use plastic body filler
d. never use plastic body filler

10. Metal shrinking is done by using

____ a. water
b. heat
c. hammer
d. all of the above

11. What is a slide hammer used for?

____ a. lower metal
b. raise metal
c. cut metal
d. weld metal

12. A dolly is used with what other body tool?

____ a. file
b. punch
c. chisel
d. body hammer

13. To pull out a dent, pull in the direction of

____ a. impact force
b. above impact force
c. opposite the impact force
d. below the impact force

14. The process of restoring stretched metal to its original contour is

____ a. hammering-on-the-dolly
b. hammering-off-the-dolly
c. pulling
d. heat shrinking

15. Which is not a type of body hammer?

____ a. roughing hammer
b. pick hammer
c. finish hammer
d. slide hammer

16. Heat shrinking is the process of shrinking stretched metal back to a smaller size by _____.

____ a. using a shrinking hammer and dolly
b. knocking down high places with a body hammer
c. using the oxy-acetylene flame and hammer and dolly
d. using grinder and cooling metal with wet towel

17. When heat shrinking, always heat the metal _____.

____ a. bright red
b. cherry red
c. black
d. lukewarm

18. To quench heated metal use ____.

____ a. a wet cloth
b. an oil bath
c. cold water
d. hot water

19. Heat shrinking should be done ____.

____ a. very slowly
b. very carefully
c. using 1500 degrees
d. very quickly

20. When heat shrinking, you would use ____.

____ a. an oxidizing flame
b. a carbonizing flame
c. neutrual flame
d. a soldering iron

Module 6.0 A

STUDENT: ______________________________ DATE: ____________

1. Demonstrate Hammer-on Technique
Demonstrate Hammer-off Technique

Given an assortment of auto body bumping hammers and dollies and sheet metal panels with minor dents/damage; "rough out" the panels by using the direct hammering techniques on one and the indirect hammering technique on the other. The damaged areas on each panel must be restored within 1/8 inch of the original contour without causing additional damage.

Emphasis will be on performance process and the instructor's standards must be met.

a. Hammer-on

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

b. Hammer-off

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

2. Pick, File, and Finish Metal

Using given hand tools including the pick hammer, and all-purpose dolly, and file; locate high and low spots in damaged sheet metal and repair them within - 1/32 inch of original contour and so the finished panel/metal has no imperfections that may be felt with the hand. Process and product must be to the instructor's standards.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

3. Pull (Remove) Minor Dents Using Slide-hammer and Pull Rods

Given sheet metal with shallow and larger dents, slide-hammer, pull rods, and all necessary tools and equipment; demonstrate proper procedures in using both pull rods and slide-hammer to remove dents restoring sheet metal to within 1/8 inch of its original contour. Performance process and product must be to instructor's standards.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

UNIT 6.0 B

METALWORKING - BODY FILLERS

AUTO BODY
METALWORKING - BODY FILLERS
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 6.0 B	METALWORKING - BODY FILLERS	
6.01	Fill Small Holes With Solder (Lead)	1
6.02	Mix and Apply Plastic Body Filler	38
6.03	Use Fiberglass to Restore Damaged Area	6
	TOTAL	45

MODULE/TASK	DESCRIPTION
Unit 6.0 B	METALWORKING - BODY FILLERS
6.01	(Fill Small Holes With Solder [Lead]) Given sheet metal, in the vertical position with 1/8 inch or less size holes to fill, oxyacetylene welder, solder, oil paddle, and body file, and necessary tools and materials; fill and smooth the holes with solder (lead) so that there are no grooves or indentations and so no additional damage is caused. The finished panel must be smooth to the hand.
6.02	(Mix and Apply Plastic Body Filler) Given a sheet metal panel with a damaged area not exceeding 1/8 inch in depth, plastic filler, plastic filler hardener, putty knife or plastic squeegee, grinder, particle mask, and the necessary tools, equipment, and materials; file and finish the depressed area with plastic filler so that there are no grooves or indentations exceeding 1/8 inch and so the repair conforms to the surrounding area.
6.03	(Use Fiberglass to Restore Damaged Area) Given sheet metal with body damage, such as a rusted out area, the necessary fiberglass filler, tools and materials; repair the area with fiberglass. Finish to original contour.

UNIT 6.0 B — METALWORKING - BODY FILLERS

TASK 6.01 (Optional and Demonstration only) — FILL SMALL HOLES WITH SOLDER (LEAD)

PERFORMANCE OBJECTIVE:

Given sheet metal, in the vertical position with 1/8 inch or less size holes to fill, oxyacetylene welder, solder, oil paddle, and body file, and necessary tools and materials; fill and smooth the holes with solder (lead) so that there are no grooves or indentations and so no additional damage is caused. The finished panel must be smooth to the hand.

PERFORMANCE ACTIONS:

6.0101	Locate holes to fill.
6.0102	Determine if soldering (leading) is best method of repairing metal.
6.0103	Assemble welder, solder, and tools.
6.0104	Prepare surface for soldering, removing paint and rust. Remove any oxide that has formed (e.g., due to welding, etc.).
6.0105	If surface to be soldered has been welded, sink the weld 1/8 inch below contour of metal.
6.0106	Tin the surface by heating, applying flux, and applying a light coat of acid core solder to the surface.
6.0107	Fill and build up the contour of the vertical surface. Check bond of solder.
6.0108	Smooth and work solder into shape by paddling with an oil treated paddle.
6.0109	Allow solder to cool. Check bond of solder.
6.0110	Finish contour by filing, etc.

PERFORMANCE STANDARDS:

- Orientation to leading.

SUGGESTED INSTRUCTION TIME: 1 Hour Optional and demonstration due to instructional costs and current field practices.

RELATED TECHNICAL INFORMATION:

- Advantages of plastic filler.

TASK 6.02 MIX AND APPLY PLASTIC BODY FILLER

PERFORMANCE OBJECTIVE:

Given a sheet metal panel with a damaged area not exceeding 1/8 inch in depth, plastic filler, plastic filler hardener, putty knife or plastic squeegee, grinder, particle mask, and the necessary tools, equipment, and materials; file and finish the depressed area with plastic filler so that there are no grooves or indentations exceeding 1/8 inch and so the repair conforms to the surrounding area.

PERFORMANCE ACTIONS:

6.0201 Inspect rough out panel.

6.0202 Select grinder and disc.

6.0203 Secure safety glasses and face mask.

6.0204 Grind panels rough.

6.0205 Select proper tools to work body filler.

6.0206 Determine type and amount of body filler required:

a. Polyester
b. Metal plastic
c. Lightweight plastic

6.0207 Mix body filler ingredients according to manufacturer's instructions.

6.0208 Apply body filler according to manufacturer's recommendations.

6.0209 Allow to cure. Check for hardness.

6.0210 Use rasp or grader file to rough cut.

6.0211 Sand smooth and featheredge taking proper actions to control filler dust.

PERFORMANCE STANDARDS:

- Mix and apply plastic body filler to damaged area using proper mixing and application procedures and filling repair so that there are no lows or highs, so the repaired areas is to original contour, and so that the repair is smooth to the hand.

TASK 6.02 MIX AND APPLY PLASTIC BODY FILLER (Con't.)

SUGGESTED INSTRUCTION TIME: 38 Hours

RELATED TECHNICAL INFORMATION:

- Safety with plastic fillers.
- Preparing metal for plastic filler.
- Mixing of filler ingredients.
- Proper technique for applying plastic filler.
- Finishing plastic filler.
- Curing time for plastic filler.

UNIT 6.0 B — METALWORKING - FIBERGLASS

TASK 6.03 — USE FIBERGLASS TO RESTORE DAMAGED AREA

PERFORMANCE OBJECTIVE:

Given sheet metal with body damage, such as a rusted out area, the necessary fiberglass filler, tools and materials; repair the area with fiberglass. Finish to original contour.

PERFORMANCE ACTIONS:

6.0301 Inspect repair to be made.

6.0302 Select proper tools and materials and fiberglass filler kit or ingredients.

6.0303 Follow safety recommendations.

6.0304 Removed damaged area, as applicable.

6.0305 Prepare surface:

a. Clean and sand.
b. Depress damaged area.
c. Cut fiberglass matting to about 2 inches larger than damaged area.

6.0306 Mix fiberglass resin per square foot of fiberglass matting, and add hardener as recommended.

6.0307 Apply matting:

a. Place matting on plastic material.
b. Lightly coat matting with resin.
c. Apply matting to damaged area with resincoated side against metal.
d. Saturate matting with resin.

6.0308 Increase the strength of the repair by additional layers of matting and resin as necessary.

6.0309 Remove bubbles with a brush or by hand.

6.0310 Allow fiberglass resin to cure.

6.0311 Use cleaning solvent to remove gummy surface of resin.

TASK 6.03 USE FIBERGLASS TO RESTORE DAMAGED AREA

PERFORMANCE ACTIONS (Con't.):

6.0312 Apply plastic filler.

6.0313 Work it and allow it to cure.

6.0314 Finish the repair.

PERFORMANCE STANDARDS:

- Use fiberglass to restore a damaged area, such as a rusted out spot or a hole, following proper procedures of preparing the metal for fiberglassing and following manufacturer's instructions for mixing and applying fiberglass repair.
- The metal must be returned to the original contour and must be smooth to the hand.

SUGGESTED INSTRUCTION TIME: 6 Hours

RELATED TECHNICAL INFORMATION:

- For metal repair, advantage of epoxy resin over polyster resin (typical polyester is easier to apply, curing time can be varied, and the cost is less).
- Safety.
- Fiberglass matting:
  - a. Cloth - strongest
  - b. Loosely woven mat (straw like) - supplies bulk in center
  - c. Chooped - filler for low-strength application
- Using heat to speed up curing.

SECOND YEAR
(Secondary Level)
AUTO BODY REPAIR

The following task objectives basically represent the second year of the secondary level Auto Body Repair program. There, however, may be overlap between the first and second year programs. If during the first year of training, there is a unique opportunity for practical shop work that might normally only be taught during the second year of the program, the instructional sequence will be modified to maximize learning opportunities.

Module 6.0 - Unit 6.0 B

STUDENT: ______________________________ DATE: ______________

1. The abrasive on a grinding disc is determined by ____.

   ____ a. size
   b. shape
   c. weight
   d. grit

2. When sanding plastic filler you should wear safety glasses and a ____.

   ____ a. shop coat
   b. rubber boots
   c. old clothes
   d. respirator

3. Manmade abrasives consist of aluminum oxide and ____.

   ____ a. iron oxide
   b. brass oxide
   c. silicon carbide
   d. plastic

4. The two types of grinding disc are ____.

   ____ a. open and closed
   b. round and square
   c. fast and slow
   d. rough and smooth

5. Abrasives are classed by size. The higher the number the ____.

   ____ a. coarser the abrasive
   b. stronger the abrasive
   c. finer the abrasive
   d. abrasive is manmade

6. Grinding disc are used to ____.

   ____ a. grind off paint
   b. shape plastic filler
   c. grind off rust
   d. all of the above

7. The work "abrasive" refers to a substance ____.

   a. that is used to cut material off a surface
   b. that is used to shine paint
   c. that is used to fill a dent
   d. that is used to clean a vinyl top

8. Grinding disc are used to ____.

____ a. clean paint
b. remove paint
c. shrink metal
d. stretch metal

9. A grinding disc is made of a round, waterproof backing and ____.

____ a. 320 sandpaper
b. wet or dry paper
c. abrasive and glue
d. a flexible pad

10. To rough cut plastic body filler, you typically would use ____.

____ a. a surform tool
b. 220 grit sandpaper
c. a 16 grit grinding disc
d. a body file

11. Before applying plastic body filler, always ____.

____ a. use metal conditioner
b. wax removing solvent
c. featheredge
d. grind off all paint.

12. When holes are punched in metal to pull out dents, they should be ____.

____ a. welded up
b. soldered up
c. filled with fiberglass
d. all of the above

13. To finish sand plastic body filler you should use ____.

____ a. 80 grit sandpaper
b. 400 grit sandpaper
c. cheese grater file
d. none of the above

14. Glazing putty is used to ____.

____ a. repair body damage
b. prevent corrosion
c. fill in scratches
d. build up featheredged areas

15. Which of the following is not likely to occur as a result of adding too much catalyst?

____ a. filler cracks
b. slower setup time
c. poor bond
d. pinholes

16. Select the best material to use for a mixing paddle when using a flexible mixing board.

____ a. putty knife
b. wood paddle
c. metal paint-stirring paddle
d. screw driver

17. Select the best material to use as a mixing board for body filler.

___ a. cardboard
b. hard rubber
c. hardboard
d. plastic

18. Plastic body filler should never be applied any thicker than ____.

____ a. 1/2 inch
b. 3/4 inch
c. 5/8 inch
d. 1/4 inch

19. If plastic body filler is applied too thick, it would tend to ____.

____ a. peel off
b. crack
c. bleed through
d. change color

20. After the metal in a damaged area has been straightened, it must be level by ____.

____ a. roughing out
b. aligning flanges
c. filling low places
d. featheredging

21. What is fiberglass resin used for?

____ a. bond glass threads together
b. to provide strength
c. prevent overheating
d. speed up the drying process

22. To repair large holes in fiberglass you generally would use ____.

____ a. body putty
b. fiberglass mat
c. a fine wire mesh
d. a backing patch

23. Fiberglass cloth is made of what?

____ a. plastic mat
b. glass particles
c. polyester resin
d. impregnated cloth fiber

24. To repair fiberglass, you would use fiberglass matting and ____.

____ a. resin
b. plastic
c. conditioner
d. activator

25. Fiberglass repairs are usually _____.

____ a. less expensive than metal repairs
b. take less time than metal repairs
c. are easier than metal repairs
d. are more expensive than metal repairs

Module 6.0 B

STUDENT: ______________________________ DATE: __________

PERFORMANCE TEST:

1. Mix and Apply Plastic Body Filler

Given a metal panel having a damaged area not exceeding 1/8 inch in depth, and the necessary materials and tools; prepare the metal, mix and apply the plastic body filler, and finish it so that the repair matches the surrounding contour, is smooth to the hand, and is prepared for painting.

CHECKLIST

Yes	No	
( )	( )	1. Metal properly prepared for filling.
( )	( )	2. Plastic filler appropriately selected.
( )	( )	3. Plastic filler mixed to a uniform color before application.
( )	( )	4. Filler applied properly.
( )	( )	5. Repaired area properly smoothed.
( )	( )	6. Tools properly used and application techniques appropriate.
( )	( )	7. Finished job to instructor's standards.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

MODULE 7.0

PAINTING AND REFINISHING

The intent of this module concerning painting and refinishing is to introduce the student to the fundamentals of preparing the vehicle for painting and finishing to specifications. Upon satisfactory completion of this unit, the graduate should be competent to enter automotive painting field as a helper or apprentice. In addition, the graduate should be better prepared to enter work such as preparing vehicles for display by dealers.

STANDARDS

- The suction feed spray gun should be tested for proper operation prior to cleaning to make sure it functions properly. This way the student's cleaning performance may be evaluated more accurately.

- The complete disassembly/assembly of a spray gun should be with the help of a schematic drawing of the particular gun unless otherwise the instructor requires disassembly/assembly without aids.

- No damage should result to a spray gun from disassembly/assembly and cleaning.

- Mixing of paints and related materials should be according to manufacturer's recommendations.

- Before masking is performed, the vehicle should be cleaned properly to assure proper adhesion of tape and paper.

- A finished taping job must stand a thorough blowing with an air pressure of up to 100 PSI (instructor's discretion) to remove dust or foreign materials and to test the bond between the tape and surface being protected.

- No masking tape is to overlap the surface being refinished.

- During painting, respirators should be worn, safety glasses should be worn during mixing, and all paint thinners or solvents that come in contact with the skin should be removed as soon as possible.

- Paint additives and solvents must be compatible as well as properly mixed.

- The mixing of paint (e.g., viscosity and proper thinner/reducer usage) must be to the instructor's standards.

- Pre-paint preparations include: Surface thoroughly washed; cleaning solvent for tar, wax, grease used; surface properly prepared; no contaminated bare metal showing.

- After painting, all equipment should be cleaned immediately.

METAL FINISHING SAFETY

1. Read instructions on finish container and follow them carefully.
2. Wash your hands after applying or using solvents to clean the work.
3. Examine the work for rough edges and burrs before attempting to clean it.
4. Use a well-ventilated area to apply finishes.
5. Keep open flames and sparks away from areas where finishes are being applied or solvents being used.
6. Use a filter mask when spraying finishes.
7. Wear goggles when buffing.
8. Secure immediate medical attention if solvents or foreign matter gets into your eye.
9. Clean up any spilled solvents or finishes.
10. Dispose of used wiping cloths by placing them in steel safety cans.

PAINTING AND REFINISHING

MINIMUM SUGGESTED TERMINOLOGY

ACRYLIC - Crystal-clear chemical compound used in lacquers and enamels to provide durability, color, and gloss retention.

ADHESION - Ability of one substance to stick to another.

AIR DRY - Drying painted finish under normal atmospheric conditions.

ALKYD - Widely-used medium for paint.

ATOMIZATION - Breaking paint into tiny droplets, forming a fog or mist from a liquid, usually accomplished with a spray gun.

BINDER - Part of the solids of a paint which holds the pigment particles together, forming a film.

BLEEDING - Where an old color comes through and colors a fresh topcoat.

BLISTERING - Bubbles which form on a paint finish.

BLUSHING - Topcoat with a milky or misty appearance.

CHALKING - Dull appearance on finish caused by pigmented power no longer held by binder.

CHIPPING - Where small segments of topcoat break away from finish.

COMPATIBILITY - When two or more materials are able to work or mix with each other. Thinners and paint are compatible. Oil and water are not compatible since they will not mix.

CONTAMINANTS - Anything on the surface of the vehicle which will adversely affect the finish, such as tar, grease, oil, wax and tree sap, is a contaminant.

CRATERING - Formation of holes in film where paint fails to cover due to surface contamination.

DRIER - Catalyst added to paint to speed curing or drying time.

ENAMEL - Type of finish which dries by evaporation of solvents and cures through chemical change.

FEATHEREDGE - Tapered paint edge going from base metal to topcoat.

FISH EYES - Small craters that appears in a finished paint film.

FLASH - First stage of drying where some of the solvents evaporate, which dulls the finish from a high gloss to a low (normal) gloss.

FLASH TIME - Time required for a finish to flash.

FORCE DRY - Drying accelerated by use of heat.

GLASS - "Sheen" of a paint film (its ability to reflect light).

HARDNESS - Quality of dry paint which gives the film resistance to surface damage.

HUMIDITY - Amount of water vapor in air.

LACQUER - Paint in which the binder is made up of solid particles. The paint film is formed by evaporation without chemical action.

MASKING - Covering of areas not to be painted.

METALLIC FINISH - Finish which includes metallic flakes in addition to pigments.

MIST COAT - Coat of rich, slow evaporating thinner with little or no color added.

PIGMENT - Solid that will not dissolve in a liquid. Pigments are ground and mixed with a vehicle/medium to provide color in paint.

PINHOLING - Small holes that form in the topcoat or undercoat.

POLISHING COMPOUND - Fine abrasive that smoothes and polished the finished paint film.

PRIMER - Base of undercoat next to the metal or substrate which improves adhesion of the topcoat.

PRIMER-SURFACER - High-solids primer that fills small imperfections and which usually is sanded before the final coat is applied.

PUTTY - Heavy-bodied material used to fill flaws that are too large to be filled by the primer-surfacer.

REDUCER - Solvent used to reduce or thin enamels.

RESPIRATOR - Device worn over the nose and mouth to filter particles out of the air being breathed.

SAGS - Runs in paint caused by excessive paint.

SANDSCRATCH SWELLING - Swelling of sandscratches in the old topcoat caused by application of solvents in new topcoat.

SEALER - Intercoat between primer and topcoat or old topcoat that promotes adhesion and holdout between two dissimilar finishes and prevents sandscratch swelling.

SILICONE - Ingredient in waxes and polishes which make them sleek and shiny. It is the primary cause of fish eyes in a finish topcoat.

SOLVENT - Liquid that dissolves, dilutes or liquefies another liquid or solid. Examples are reducers, thinners, and cleaners.

SQUEEGEE - Rubber block, often small and rectangular, used to wipe off wet sanded areas or to apply putty.

TACK RAG - Cloth saturated with diluted varnish to make it tacky or sticky so it will pick up small particles of dust and dirt.

THINNER - Solvent used to thin or dilute lacquers.

VEHICLE/MEDIUM - All of the paint except the pigment. Includes solvents, dilutents, resins, gums, driers, etc.

VISCOSITY - Thickness of liquid.

WATERSPOTTING - Where water droplets mar the finish before it has cured.

WET SPOTS - Where paint fails to dry and adhere uniformly. Caused by grease spots, finger marks, and oil spots.

WRINKLING - Skinning of a coat of thick or heavy paint before the underpart of the film has properly dried.

AUTO BODY
PAINTING AND REFINISHING
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 7.0	PAINTING AND REFINISHING	
7.01	Locate Paint Code and Determine Materials for Painting Repair	*
7.02	Clean Metal Surfaces for Undercoat	*
7.03	Sand Metal Surfaces for Undercoat	*
7.04	Featheredge All Broken Areas of Finish	*
7.05	Mask Sections and Parts	*
7.06	Clean and Adjust Spray Gun	**
7.07	Demonstrate Proper Technique in Using Spray Gun	**
7.08	Apply Primer-Surfacer (Undercoat)	*
7.09	Apply Color Coats	*
7.10	Clean and Compound a Painted Surface Polishing by Hand and With Buffer	*
7.11	Air Drying Painted Surface	*
7.12	Remove and Apply Decals and Stripes	*
7.13	Replace Woodgrain Panels	N/A
7.14	Detailing and Exterior and Interior Clean-up	*
	TOTAL	359

*Time depends on size of surface to be prepared
**Integrated training

MODULE/TASK	DESCRIPTION
Module 7.0	PAINTING AND REFINISHING
7.01	(Locate Paint Code and Determine Materials for Painting Repair) Given a vehicle to paint, locate the manufacturer's paint code and determine how much and what type of material will be needed for the paint repair.
7.02	(Clean Metal Surfaces for Undercoat) Given a metal panel or vehicle, solvents, and the necessary tools, equipment, and materials; clean the metal for undercoat. Wax, grease, and foreign matter must be completely removed from the bare metal surface.
7.03	(Sand Metal Surfaces for Undercoat) Given a clean metal panel, sander, sanding blocks and pads, particle mask, the necessary tools, equipment, and materials; sand the metal panel for undercoating. The finished metal must be free of paint and rust. Edges of the surrounding paint must be tapered to ensure the undercoat bonds with the panel.
7.04	(Featheredge All Broken Areas of Finish) Given a vehicle with broken areas of paint, all necessary materials, tools, and equipment; featheredge all breaks in the finish to a condition where all layers are tapered at least 1/8 - 3/4 inch.
7.05	(Mask Sections and Parts) Given a vehicle or panel requiring masking, a service manual or making specifications, masking materials, and the necessary tools, equipment, and materials; mask all sections and parts.
7.06	(Clean and Adjust Spray Gun) Given the shop spray gun(s) and related equipment, and typical cleaning materials: a. Clean the spray gun so that the gun functions properly when assembled and is free of paint residues. b. Adjust the gun and air pressure to spray enamel seal over primer surface, without runs or sags.
7.07	(Demonstrate Proper Techniques in Using Spray Gun) Given metal to spray paint, a suction feed paint gun, paint, and all necessary accessories; demonstrate the proper techniques in using the spray gun. The instructor's standards apply.

7.08 (Apply Primer-Surfacer [Undercoat]) Given a vehicle or panels prepared for undercoating, undercoating (primer, primer-surfacer), assortment of thinners, respirator, and the necessary tools, equipment, and materials; apply the undercoats. Base material selected must meet requirements for topcoat and must be applied smooth and wet to ensure proper adhesion. Water and dry sand to a condition where there are no flaws in the surface, so that the finish is smooth and uniform in appearance with no sags or runs and is ready for the topcoat. Performance process and product may be evaluated by a checklist and all items must be rated acceptable.

7.09 (Apply Color Coats) Given an undercoated vehicle or panel, spray equipment, color coat, and assortment of thinners, respirator, and the necessary tools, equipment, and materials; apply the color coats. Color coats must be applied as wet as possible without sags or runs and must have a smooth and uniform finished appearance.

7.10 (Clean and Compound a Painted Surface Polishing by Hand and With Buffer) Given a painted vehicle or panel, compound, and the necessary tools, equipment, and materials; clean and compound the painted surface to a smooth and glossy appearance, free of defects and foreign matter, so that there are no burned spots or buff throughs on the finish.

7.11 (Heat Drying Painted Surface) Given a painted panel requiring drying by heat; heat dry the panel so that the finished work has a glossy appearance.

7.12 (Remove and Apply Decals and Stripes) Given a vehicle requiring removal or application of decals and stripes, and the necessary tools, equipment, and materials; remove and apply decals and stripes. The stripes and decals must be positioned correctly and show no wrinkles, air bubbles, or other imperfections.

7.13 (Replace Woodgrain Panels) Given a vehicle which requires the replacement of woodgrain panels, remove and replace the transfer without using references, not damaging adjoining panels, so that the new panel is correctly positioned with no bubbles, wrinkles, or imperfections visible, and so that all trim parts are replaced correctly.

7.14 (Detailing and Exterior and Interior Clean-up) Given a vehicle that has been painted, and the necessary tools, equipment, and materials; properly detail the vehicle and perform the exterior and interior clean-up. All masking materials, dirt, grease, and foreign matter must be removed from the exterior of the vehicle. The interior should be vacuumed, upholstery cleaned, and windows free of film.

TASK 7.01 LOCATE PAINT CODE AND DETERMINE MATERIALS FOR PAINTING REPAIR

PERFORMANCE OBJECTIVE:

Given a vehicle to paint, locate the manufacturer's paint code and determine how much and what type of material will be needed for the paint repair.

PERFORMANCE ACTIONS:

7.0101 Locate paint code number on body ID tag/plate to determine type and color of paint used by manufacturer.

7.0102 Determine if paint selection is to be by: (a) manufacturer's code or (b) new paint selection (changing color, etc.). (See Related Technical Information.)

7.0103 If different type of paint from manufacturer's use is considered, determine if it is compatible with original paint without use of special sealers. (See Related Technical Information.)

7.0104 Determine materials to order.

PERFORMANCE STANDARDS:

- Locate paint code and determine materials to order for painting a given vehicle.
- Manufacturer's paint code must be properly identified.
- Paint selection must be compatible with original finish.
- Materials list must be in agreement with instructor's estimate.

SUGGESTED INSTRUCTION TIME: Time depends on size of surface.

RELATED TECHNICAL INFORMATION:

- Identify Refinishing Systems:
    - Acrylic Lacquer
    - Synthetic Enamel
    - Acrylic Enamel
    - Urethane Enamel
- Determine compatibility of paints: (e.g.)
    - Acrylic lacquer is usable over old lacquer and acrylic lacquer

RELATED TECHNICAL INFORMATION (Con't.):

    - Acrylic lacquer can be used over enamel that has been sealed.
- Check application book from paint supplier for exact color and code.
- Identify:
    - Lacquers
    - Enamels
    - Thinners and Reducers
    - Primers and Surfacers
    - Sealers
    - Custom Paints
    - Clears
    - Additives
- Use proper paint terminology.

TASK 7.02 CLEAN METAL SURFACES FOR UNDERCOAT

PERFORMANCE OBJECTIVE:

Given a metal panel or vehicle, solvents, and the necessary tools, equipment, and materials; clean the metal for undercoat. Wax, grease, and foreign matter must be completely removed from the bare metal surface.

PERFORMANCE ACTIONS:

7.0201 Wash vehicle or panel.

7.0202 Clean metal with chemical cleaner.

7.0203 Strip old finish.

7.0204 Condition metal: (Use rubber gloves and goggles)

a. Identify and select metal conditioner(s).
b. Demonstrate proper metal cleaning techniques.
c. Explain purpose of metal conditioner.
d. Demonstrate procedure for applying metal conditioner.
    (1) Delute according to specifications.
    (2) Apply with brush or sponge.
    (3) Wipe dry using clean dry cloth.

7.0205 Etch bare metal.

7.0206 Clean up with chemical cleaner.

PERFORMANCE STANDARDS:

- Clean given metal surfaces of wax, grease, and foreign matter, so that metal is prepared to receive undercoating, completing the task in flat rate time plus 50 percent, meeting instructor's standards and manufacturer's specifications.

SUGGESTED INSTRUCTION TIME: Time depends on size of surface to be prepared.

RELATED TECHNICAL INFORMATION:

- Metal conditioning.
- Etching.
- Cleaning with chemical cleaner.
- Safety precaution.
- Action of paint stripper on plastic filler.

CHECKLIST APPLICABLE TO THIS TASK FOLLOWS AFTER TASK 7.04

MODULE 7.0 PAINTING AND REFINISHING

TASK 7.03 SAND METAL SURFACES FOR UNDERCOAT

PERFORMANCE OBJECTIVE:

Given a clean metal panel, sander, sanding blocks and pads, particle mask, and the necessary tools, equipment, and materials; sand the metal panel for undercoating. The finished metal must be free of paint and rust. Edges of the surrounding paint must be tapered to ensure the undercoat bonds with the panel.

PERFORMANCE ACTIONS:

7.0301 Identify and demonstrate proper use of sanders (i.e., orbital, etc.).

7.0302 Identify sandpaper by type and grade.

7.0303 Identify sanding blocks and pads.

7.0304 Demonstrate use of manual and power sanding equipment.

7.0305 Demonstrate proper procedure for sanding metal surfaces.

7.0306 Demonstrate proper procedure for featheredging a painted metal surface.

PERFORMANCE STANDARDS:

- Sand metal surfaces for undercoating, removing paint and rust, and tapering edges to ensure undercoating bond to panel, meeting instructor's standards.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Use of grinder and sander.
- Sandpaper types and grades.
- Safety precautions.
- Use sandpaper to remove paint and rust.

CHECKLIST APPLICABLE TO THIS TASK FOLLOWS AFTER TASK 7.04

TASK 7.04 FEATHEREDGE ALL BROKEN AREAS OF FINISH

PERFORMANCE OBJECTIVE:

Given a vehicle with broken areas of paint, all necessary materials, tools, and equipment; featheredge all breaks in the finish to a condition where all layers are tapered back at least 1/8 - 3/4 inch.

PERFORMANCE ACTIONS:

7.0401 Identify all areas to be featheredged: Stone bruises, necks, or areas where body work has been done, where there are breaks in finish.

7.0402 Sand area to taper abrupt edge gradually out to level of old finish (extending beyond edge to improve adhesion of new paint). (Spot prime several times and, when dry, block sand with 220-grit sandpaper and a paint paddle. If areas feel flat to touch, proceed to next area.)

PERFORMANCE STANDARDS:

- Featheredge all broken areas of given metal so all layers are tapered back at least 1/8 - 3/4 inch.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

(NOTE: May be combined with preceeding task.)

RELATED TECHNICAL INFORMATION:

- Safety precautions.
- Wet and dry sanding.
- 240-grit waterproof sandpaper silicone carbide paper and 180-A grit silicone carbide saturated paper.
- Enamel sealer, enamel reducer, lacquer thinner.
- Chemical featheredging.
- Sandscratch swelling.
- Use/technique of D.A. sander, jitterbug, sanding block, and featheredging by fingers.

CHECKLIST APPLICABLE TO THIS TASK FOLLOWS AFTER TASK 7.04

CHECKLIST

PREPARE METAL SURFACES FOR UNDERCOATING

	Acceptable	Not Acceptable
1. Cleaning metal and apply precleaning solvent correctly.	( )	( )
2. Featheredging smooth 1/8 - 3/4 inch all around damaged area.	( )	( )
3. Sands remaining area with correct sandpaper for lacquer paint.	( )	( )
4. Treats metal correctly.	( )	( )
5. Accomplished task in stipulated time.	( )	( )

PERFORMANCE OBJECTIVE:

Given a vehicle or panel requiring masking, a service manual or masking specifications, masking materials, and the necessary tools, equipment, and materials; mask all sections and parts.

PERFORMANCE ACTIONS:

7.0501 Clean and dry areas to be masked.

7.0502 Select masking tape and paper.

7.0503 Demonstrate proper procedures of applying masking to areas* to be covered.

*Competency is to include:

a. Mask windshield and rear glass.
b. Mask panel (rear quarter panel along natural breaks).
c. Mask windows.
d. Mask wheels.
e. Mask door handles.
f. Mask small trim and hardware.
g. Mask upholstery.
h. Mask antenna and wiper blades.
i. Reverse tape hood and trunk lid.
j. Mask front lights.

PERFORMANCE STANDARDS:

- On a given vehicle, mask required parts so that no paint is applied to tires, glass, or other surfaces not being painted.
- Masking must not cover any surface to be painted.
- Masking should withstand an air pressure blowing test of 75 PSI with proper tape bond/adhesion.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Safety precautions.
- Reverse taping procedure.
- "Kinling" tape by running it between thumb and forefinger for application to new paint.
- Masking natural breaks.

CHECKLIST ACCOMPANIES THIS TASK

CHECKLIST

MASK SECTIONS AND PARTS

	Acceptable	Not Acceptable
1. Correct width tape and paper selected.	( )	( )
2. Tape and paper applied to clean and dry surface.	( )	( )
3. Tape applied to weatherstripping.	( )	( )
4. Tape applied by acceptable techniques.	( )	( )
5. Tape applied firmly and stretched tightly.	( )	( )
6. Tape torn correctly.	( )	( )
7. Pleats folded and taped.	( )	( )
8. Masking applied along natural breaks.	( )	( )
9. Used method of reverse taping correctly.	( )	( )
10. Trim and lettering masked correctly.	( )	( )

PERFORMANCE OBJECTIVE:

Given the shop spray gun(s) and related equipment, and typical cleaning materials: Clean the spray gun so that the gun functions properly when assembled and is free of paint residues. Adjust the gun and air pressure to spray enamel seal over primer surface, without runs or sags.

PERFORMANCE ACTIONS:

7.0601 CLEAN SPARY GUN: Select and inspect spray gun to be sure it was properly cleaned immediately after previous use and is free of paint residues.

To clean a suction-feed* gun:

a. Loosen materials cup and back out the air-cap ring 2-3 turns.
b. Hold folded cloth air-cap and pull trigger to reverse air into fluid passages and force partially dried paint back into cup.
c. Dump cup and rinse it thoroughly with solvent/reducer.
d. Pull trigger so solvent will flush out partially cleaned passages.
e. Use solvent-soaked rag/brush to clean exterior of gun (Gun should not be dunked in solvent since that would remove lubricants and deteriorate gasket material.).
f. Unthread air cap, dip it in solvent, and blow dry with compressed air. (Soak in solvent to clean out clogged air-cap passages or clean with straw manually not using wire or other materials which may change size or shape of ports and ruin air-cap.).

*Pressure-feed guns cleaned according to manufacturer's instructions.

7.0602 ADJUST OR OVERHAUL SPRAY GUN: Adjust air pressure, fluid valve and air valve to spray paint an enamel sealer without runs or sags. (If necessary, correctly overhaul and reassemble gun to specifications.)

TASK 7.06 CLEAN AND ADJUST SPRAY GUN (Con't.)

PERFORMANCE STANDARDS:

- Clean and adjust spray gun to spray enamel sealer without runs or sags and so the gun operates to specifications.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify difference in section-feed and pressure-feed guns.
- Identify/select solvent/reducers for cleaning guns.
- Identify/select proper air pressure for spray gun painting.
- Mixing paint for spray gun.

MODULE 7.0 PAINTING AND REFINISHING

TASK 7.07 DEMONSTRATE PROPER TECHNIQUE IN USING SPRAY GUN

PERFORMANCE OBJECTIVE:

Given metal to spray paint, a suction feed paint gun, paint, and all necessary accessories; demonstrate the proper techniques in using the spray gun. The instructor's standards apply.

PERFORMANCE ACTIONS:

7.0701 Adjust clean spray gun and air pressure for desired pattern and atomization, testing spray pattern on scraps until proper oval is obtained (9 inches high and 2 inches wide).

7.0702 a. Hold gun correct distance from work surface (about 6-8 inches for lacquers, 8-10 inches for enamels) to avoid sags caused by being too close or dusting by being too far.
b. Hold gun correct distance during entire stroke so gun is perpendicular to surface of work to prevent streaks, sags, and runs.

7.0703 Work for a wet coat using steady strokes that overlap 50 percent.

7.0704 Pull the trigger when starting the stroke and release the trigger when completing the stroke, continuing the stroke briefly before reversing direction.

(NOTE: Other techniques will be demonstrated during instruction.)

7.0705 Observe proper air pressure when spraying and spray vehicle in recommended sequence.

PERFORMANCE STANDARDS:

- Demonstrate proper technique in using spray gun to the instructor's standards.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Assembly and adjustment of spray gun and spray equipment.
- Air pressure adjustments.

CHECKLIST ACCOMPANIES THIS TASK

PERFORMANCE CHECKLIST

CLEAN, ADJUST, AND USE SPRAY GUN

These performance actions should be considered the minimum necessary for competency in cleaning, adjusting, and using the paint spray gun.

	Acceptable	Unacceptable
1. Spray gun assembled correctly.	( )	( )
2. Spray gun adjusted correctly.	( )	( )
3. Spray gun held correctly.	( )	( )
4. Trigger used correctly.	( )	( )
5. Paints in alternate strokes.	( )	( )
6. Overlaps 50 percent.	( )	( )
7. Painted surface without sags, runs, dry spray, or zebra effects.	( )	( )
8. Banding performed correctly.	( )	( )
9. Cornering performed correctly.	( )	( )
10. Spray gun cleaned and stored properly.	( )	( )

Adapted from Auto Body Repair, Charleston, WV; Vocational Curriculum Laboratory, State Department of Education, p. 46, 1979.

MODULE 7.0 PAINTING AND REFINISHING

TASK 7.08 APPLY PRIMER-SURFACER (UNDERCOAT)

PERFORMANCE OBJECTIVE:

Given a vehicle or panels prepared for undercoating, undercoating (primer, primer-surfacer), assortment of thinners, respirator, and the necessary tools, equipment, and materials; apply the undercoats. Base material selected must meet requirements for topcoat and must be applied smooth and wet to ensure proper adhesion. Water and dry sand to a condition where there are no flaws in the surface, so that the finish is smooth and uniform in appearance with no sags or runs and is ready for the topcoat. Performance process and product may be evaluated by a checklist and all items must be rated acceptable.

PERFORMANCE ACTIONS:

7.0801 Determine proper ratios and proportions for mixing.

7.0802 Select and inspect spray equipment, rubber squeegees, and paint paddles.

7.0803 Select proper type of undercoat, primer, or primer/sealer for job.

7.0804 Select thinners by grade/uses.

7.0805 Ensure surface has been properly prepared.

7.0806 Mix proper ratios for undercoating and additives.

7.0807 Apply undercoat to given metal with no sags or runs.

7.0808 Hand sand primer-surfaces before refinished.

PERFORMANCE STANDARDS:

- Apply primer-surfacer and hand sand so that there are no flaws in surface and so that surface is ready for the topcoat. Undercoating is to have no sags or runs.
- Performance must be to instructor's standards.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify properties of undercoats.
- Explain purpose of undercoating.
- Identify thinners by grade and uses.
- Thinners and reducers.
- "Flash off."
- Sanding.
- Tacking.
- Sandpaper.
- Handsanding.
- Dry sanding.
- Wet sanding.
- Primer gun.
- Primer surfacer.
- Lacquer thinner.
- Sanding block.
- 320 grit sandpaper (400 if used).
- Advantage of 9 inch grinding disc.

CHECKLIST

APPLY UNDERCOATING

	Acceptable	Unacceptable
1. Mixes primer-surfacer correctly.	☐	☐
2. Allows proper time between coats of primer-surfacer.	☐	☐
3. Primer-surfacer applied smoothly without sags, runs, or zebra effect.	☐	☐
4. Applies paint putty correctly.	☐	☐
5. Sands putty correctly.	☐	☐
6. Compounds area correctly.	☐	☐
7. Mixes sealer correctly.	☐	☐
8. Applies even medium coat of sealer to area.	☐	☐
9. Scuffs and tacks sealer properly.	☐	☐

TASK 7.09 APPLY COLOR COATS

PERFORMANCE OBJECTIVE: (*See accompanying objectives.)

Given an undercoated vehicle or panel, spray equipment, color coat, an assortment of thinners, respirator, and the necessary tools, equipment, and materials; apply the color coats. Color coats must be applied as wet as possible without sags or runs and must have a smooth and uniform finished appearance.

PERFORMANCE ACTIONS:

7.0901 Inspect area, panel, or vehicle to be painted.

7.0902 Determine type and amount of paint.

7.0903 Mix and prepare paint according to manufacturer's instruction.

7.0904
a. Strain paint into cup.
b. Select proper thinner or reducer.
c. Reduce paint so it will spray uniformly.
d. Add any additives necessary (e.g., silicone additive, retarder).

7.0905 Set air pressure.

7.0906 Adjust pattern and fluid control.

7.0907 Apply necessary number of coats allowing drying time between coats.

PERFORMANCE STANDARDS:

- On a given vehicle or panel, apply color coats as wet as possible without sags or runs so that the finish is smooth and uniform in appearance.
- Performance process and product must meet instructor's standards.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Handling and mixing paints.
- Surface preparation procedures.
- Types of paints.
- Properties of paints.

TASK 7.09 APPLY COLOR COATS

RELATED TECHNICAL INFORMATION:

- Mixing ratios for color coat and additives.
- Effects of heat and humidity on paint during application.
- Spray viscosity.
- Use of activators.
- Drying times for various paints.
- Color coat application procedures: Painting techniques
- Safety precautions.
- Paint booth preparation and clean-up.
- "Mist coat."

CHECKLIST ACCOMPANIES THIS TASK (AND FOLLOWING TASK)

*CONTINUATION OF PERFORMANCE OBJECTIVES:

A. LACQUER (Cellulose): [Orientation Task]

Observe spot painting solid color with lacquer so that the new paint blends completely with the old finish.

RELATED TECHNICAL INFORMATION:

- Thinners

B. ACRYLIC:

Paint a panel with acrylic lacquer so that the finish is acceptable and matches the shine of the vehicle.

RELATED TECHNICAL INFORMATION:

- Thinners

C. ENAMELS: (Synthetic and Acrylic)

Paint a panel with enamel so that the finish meets acceptable standards and matches the color and shine of the vehicle.

RELATED TECHNICAL INFORMATION:

- Reducers

D. URETHANE ENAMEL:

RELATED TECHNICAL INFORMATION:

- Safety precaution

E. METALLIC COLORS:

Paint a spot or panel with metallic colored lacquer. The painted area must match the surrounding area in color and blend.

RELATED TECHNICAL INFORMATION:

- Metallic finish
- Color effect
- Stirring paint
- Blending of spot repair
- Making a test panel
- Mist or kiss coat of thinned acrylic

E. SPLATTER:

Apply spatter paint to an appropriate part of the vehicle (e.g., trunk interior).

TASK 7.10 CLEAN AND COMPOUND A PAINTED SURFACE POLISHING BY HAND AND WITH BUFFER

PERFORMANCE OBJECTIVE:

Given a painted vehicle or panel, compound, and the necessary tools, equipment, and materials; clean and compound the painted surface to a smooth and glossy appearance, free of defects and foreign matter, so that there are no burned spots or buff throughs on the finish.

PERFORMANCE ACTIONS:

7.1001 Select compound for color coat.

7.1002
a. Demonstrate proper techniques for hand polishing.
b. Demonstrate proper techniques for machine buffing.

PERFORMANCE STANDARDS:

- Clean and compound a painted surface, polishing by hand and with buffer so that the painted surface has a smooth and glossy appearance free of defects and foreign matter and so that there are no burned spots or buff throughs on the finish, completing the job to the instructor's standards.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Describe properties of compound.
- Techniques for hand rubbing compound.
- Techniques for machine polishing compound.
- Safety precautions.
- Polishers.
- Compounding pads.
- Polishing bonnets.
- Masking of styling lines.

CHECKLIST ACCOMPANIES THIS TASK AND PRECEEDING TASK

CHECKLISTS

MATCH COLOR PAINT

	Acceptable	Unacceptable
1. Selects correct reducer-thinner according to shop conditions.	( )	( )
2. Mixes correct amount of reducer-thinner according to shop conditions.	( )	( )
3. Uses spray gun to match color correctly.	( )	( )
4. Uses reference chart to match color.	( )	( )
5. Color matched as close as possible (to instructor's standards).	( )	( )

PAINT VEHICLE OR PANELS

	Acceptable	Unacceptable
1. Mixes paint according to shop conditions.	( )	( )
2. Uses spray gun correctly.	( )	( )
3. Paints surface without defects.	( )	( )
4. Applies mist coat correctly.	( )	( )
5. Uses rubbing compound correctly.	( )	( )
6. Observes safety precautions.	( )	( )

CHECKLIST

PAINT VEHICLE

	Acceptable	Unacceptable
1. Spray gun used and cleaned correctly.	( )	( )
2. Featheredging 1/8 - 3/4 inch around repair.	( )	( )
3. Treats metal correctly.	( )	( )
4. Vehicle masked correctly.	( )	( )
5. Mixes primer-surfacer according to shop conditions.	( )	( )
6. Applies primer-surfacer smoothly (without runs, sags, or zebra effects).	( )	( )
7. Paint putty applies and sanded.	( )	( )
8. Sealer mixed and applied correctly.	( )	( )
9. Selects correct reducer according to shop conditions.	( )	( )
10. Mixes correct amount of reducer-thinner according to shop conditions.	( )	( )
11. Color is matched so that there is no difference visible under natural light.	( )	( )
12. Surface was painted without runs, sags, zebra, effects, cracks, etc., after drying.	( )	( )
13. Observed safety precautions.	( )	( )

NOTE: Strike through any items not applicable.

TASK 7.11 (Orientation) AIR DRYING PAINTED SURFACE

PERFORMANCE OBJECTIVE:

Given a painted panel requiring drying by air; air dry the panel so that the finished work has a glossy appearance.

PERFORMANCE ACTIONS:

7.1101 Inspect painted surface and select proper equipment.

7.1102 As applicable:

a. Select lamp most suited for drying operation.
b. Determine and set proper lamp Distance.
c. Set proper lamp temperature.
d. Select proper time for lamp setting.

7.1103 Air dry painted surface for glossy appearance.

PERFORMANCE STANDARDS:

- Air dry painted surface for glossy appearance.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Force drying temperatures.
- Baking temperatures.
- Radiant and convection baking.
- Safety precautions.
- Effects of excess heat on painted surfaces.

*Secondary shops are designed for air drying.

MODULE 7.0 PAINTING AND REFINISHING

TASK 7.12 REMOVE AND APPLY DECALS AND STRIPES

PERFORMANCE OBJECTIVE:

Given a vehicle requiring removal or application of decals and stripes, and the necessary tools, equipment, and materials; remove and apply decals and stripes. The stripes and decals must be positioned correctly and show no wrinkles, air bubbles, or other imperfections.

PERFORMANCE ACTIONS:

7.1201 If necessary, remove decals and stripes by standards practices.

7.1202 Prepare surface for new decals or stripes.

7.1203 Demonstrate proper procedures for applying vinyl or painted stripes:

a. If stripes are to be painted:
  (1) Mask area using standard procedures and special masking tape.
  (2) Paint stripes using correct paint selection, first applying sealer, then painting by standard techniques.
  (3) When dry, remove masking.
b. If stripes are to be taped on, select proper color and width of tape and apply by adhesive backing to a clean surface.

7.1204 Remove any air bubbles and wrinkles.

PERFORMANCE STANDARDS:

- Remove and apply decals and stripes as required. Stripes and decals must be positioned correctly and show no wrinkles, air bubbles, or other imperfections.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Applying "accent stripe tape."
- Painting pin stripes.
- Use of squeegee, straight edges, grease pencils.

CHECKLIST

APPLY STRIPES

	Acceptable	Unacceptable
1. Prepares surface correctly.	( )	( )
2. Applies striping tape straight.	( )	( )
3. Tape correctly bent or formed for curves.	( )	( )
4. Area around striping tape washed correctly.	( )	( )
5. Adjusts spray gun to correct pressures.	( )	( )
6. Applies paint correctly.	( )	( )

TASK 7.13 (Optional) REPLACE WOODGRAIN PANELS

PERFORMANCE OBJECTIVE:

Given a vehicle which requires the replacement of woodgrain panels, remove and replace the transfer without using references, not damaging adjoining panels, so that the new panel is correctly positioned with no bubbles, wrinkles, or imperfections visible, and so that all trim parts are replaced correctly.

(NOTE: Replacement of woodgrain overlay generally requires a high level of skill. Therefore, this task should be considered orientation unless otherwise specified.)

PERFORMANCE ACTIONS:

7.1301 Assemble tools and replacement panel and materials to remove old panel and install new panel.

7.1302 Remove exterior molding and trim without causing damage.

7.1303 Remove old woodgrain panel correctly.

7.1304 Prepare surface correctly.

7.1305 Apply new transfer correctly.

7.1306 Remove all air bubbles, wrinkles, or other imperfections.

7.1307 Install exterior trim and molding correctly.

PERFORMANCE STANDARDS:

- Replace woodgrain panels so that no damage is caused to the vehicle or exterior molding or trim and so that the new panel shows no bubbles, wrinkles, water, or imperfections and is positioned correctly with trim correctly installed.

SUGGESTED INSTRUCTION TIME: N/A

RELATED TECHNICAL INFORMATION:

- Adhesive remover.
- Temperature effects on vinyl overlay installation.
- Cutting overlap panels (1/2" larger than panel).
- Overlay repair.
- Safety precautions (e.g., solvent fumes).

CHECKLIST

REPLACE WOODGRAIN PANELS

	Acceptable	Unacceptable
1. Uses tools correctly.	( )	( )
2. Removes exterior molding/trim without causing damage.	( )	( )
3. Removes old woodgrain correctly.	( )	( )
4. Prepared surface correctly.	( )	( )
5. Applies new transfer correctly.	( )	( )
6. Removes all air bubbles, wrinkles, or other imperfections.	( )	( )
7. Installs exterior trim parts correctly.	( )	( )

MODULE 7.0 PAINTING AND REFINISHING

TASK 7.14 DETAILING AND EXTERIOR AND INTERIOR CLEAN-UP

PERFORMANCE OBJECTIVE:

Given a vehicle that has been painted, and the necessary tools, equipment, and materials; properly detail the vehicle and perform the exterior and interior clean-up. All masking materials, dirt, grease, and foreign matter must be removed from the exterior of the vehicle. The interior should be vacuumed, upholstery cleaned, and windows free of film.

PERFORMANCE ACTIONS: (Some actions typically may be accomplished by clean-up crew in retail trade.)

7.1401 Assemble cleaning supplies for body panels, bumpers, white walls, windows, carpets and mats, upholstery.

7.1402 Assemble all parts to be installed on vehicle and replace emblems, chrome, trim, etc.

7.1403 Clean all overspray from glass, chrome, interior, wheels, and tires, etc.

7.1404 Vacuum and clean, wash exterior, and dry.

7.1405 Black-out overspray under wheel openings.

PERFORMANCE STANDARDS:

- Perform exterior and interior clean-up of painted vehicle removing all masking materials and replacing all trim, etc., so that vehicle is properly prepared for delivery to customer.

SUGGESTED INSTRUCTION TIME: ** (Integrated training)

RELATED TECHNICAL INFORMATION:

- Installing trim, chrome, emblems, on vehicle.
- Cleaning interior and exterior of vehicle.
- Washing freshly painted vehicle.

Module 7.0

STUDENT: ______________________________ DATE: __________

1. When removing paint from fiberglass, never use ____.

____ a. sandpaper
b. grinding disc
c. paint remover
d. lacquer removing solvent

2. A crack in fiberglass should always be reinforced on the ____.

____ a. front side
b. back side
c. lower side
d. upper side

3. An automobile is painted for ____.

____ a. sound deadening
b. rust protection
c. appearance and protection
d. keeping the car cool

4. What grit paper is the coarser?

____ a. 400
b. 600
c. 320
d. 220

5. What grit paper is usually recommended for featheredging?

____ a. 16
b. 80
c. 400
d. 320

6. What grit disks are used to remove paint?

____ a. 36
b. 16
c. 24
d. 50

7. When spraying acrylic enamel about what distance should the spray gun be from the metal?

____ a. 2 to 3 inches
b. 4 to 6 inches
c. 6 to 8 inches
d. 8 to 10 inches

8. When spraying paint, approximately how much overlap is recommended?

____ a. 20 percent
b. 30 percent
c. 40 percent
d. 50 percent

9. What pressure is recommended when spraying lacquer?

____ a. 45 lbs.
b. 55 lbs.
c. 65 lbs.
d. 75 lbs.

10. What pressure is recommended when spraying acrylic enamel metalics?

____ a. 65 lbs.
b. 75 lbs.
c. 35 lbs.
d. 45 lbs.

11. What ratio is primer generally thinned?

____ a. one to one
b. three to one
c. two to one
d. four to one

12. What ratio is lacquer generally thinned?

____ a. 1 1/2 to 1
b. 2 to 1
c. 3 to 1
d. 4 to 1

13. Almost all paint materials are _____.

____ a. water soluble
b. mixed with oil
c. potential fire hazards
d. black in color

14. A tack rag is used to ____.

____ a. polish a car
b. dissolve old paint
c. pick up lint, dust and dirt
d. make the masking tape tacky.

15. A spray gun operates on what?

____ a. vacuum
b. water pressure
c. hydraulic pressure
d. compressed air

16. A type of fast drying paint is _____.

____ a. dmron
b. lacquer
c. enamel
d. synthetic

17. The first lacquer paint was ____.

____ a. acrylic
b. synthetic
c. nitrocellulose
d. magic mirror

18. A drying oven is used to ____.

____ a. bake paint
b. force dry paint
c. keep paint from running
d. prevent fisheyes

19. There are 2 types of spray guns, pressure feed and _____.

____ a. electric
b. compressed air
c. pressure pot
d. suction feed

20. Common shop painting safety equipment includes _____.

____ a. respirators
b. face mask
c. safety goggles
d. all of the above

21. Which one of the following is not a basic type of enamel material used in the automotive industry?

____ a. polyester
b. alkyd
c. acrylic
d. polyurethane

22. Which one of the following is caused by a thinner or reducer which does not evaporate quickly enough?

____ a. sagging
b. orange peel
c. overspray
d. cracking and crazing

23. Wrinkling is usually not caused by which one of the following?

____ a. moisture in the top coat material
b. incorrect reduction
c. overly heavy application
d. an attempt to force dry the material too rapidly

24. Which one of the following is not a typical cause that will most frequently lead to the top coat condition known as running?

____ a. incorrect material viscosity
b. incorrect cornering technique
c. movement of spray gun too slowly over surface
d. pattern spread control too wide

25. Auto body rust is a chemical reaction called ____.

____ a. saturation
b. evaporation
c. oxidation
d. penetration

26. Rust is caused by metal being exposed to ____.

____ a. moisture
b. chemicals
c. air
d. fumes

27. If rust is not removed from metal, it will eat through the metal within ____.

____ a. a few months
b. a few years
c. none of the above
d. all of the above

28. There are 2 types of rust that generally show up on the auto body. These are rust out and ____.

____ a. burn out
b. oxidation
c. surface rust
d. break out

29. Rust can begin on the inside of the auto body and work out, or it can begin ____.

____ a. on the outside and work inside
b. begin on the top and work down
c. begin at the bottom and work up
d. anyplace there is no undercoating.

30. If surface rust is not removed as soon as possible, it will cause ____.

____ a. flaking paint
b. rust out
c. customer complaints
d. stains on paint

31. One of the major causes of rust out is ____.

____ a. chips in paint
b. no wax on car
c. not keeping car clean
d. stopped up drain holes

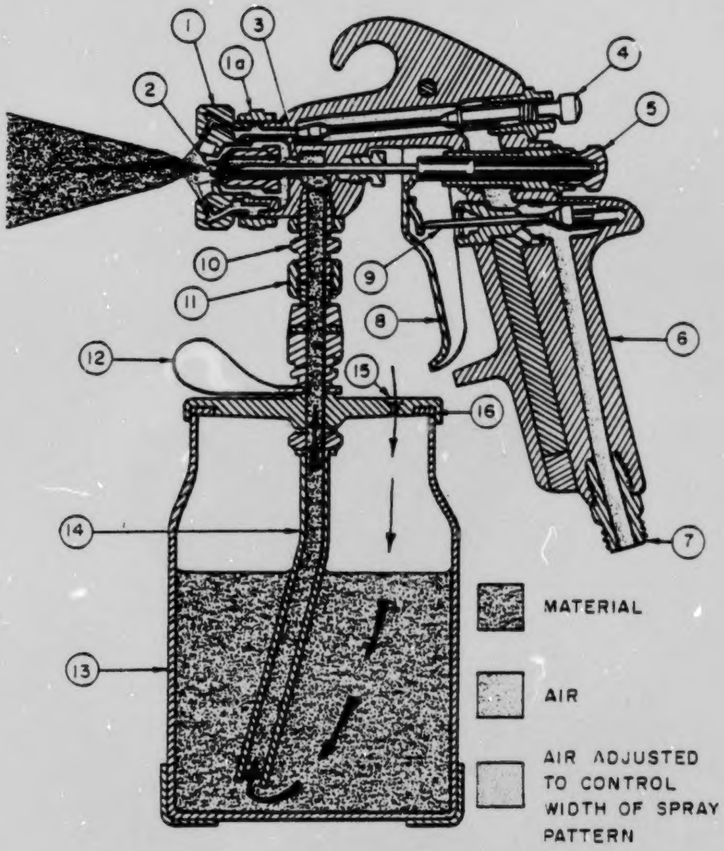
32. To correct rust damage, you first must determine the ____.

____ a. source
b. area
c. severity
d. type

33. Identify the parts of the spray gun below by placing the identifying letters from the left-hand column in the appropriate spaces at the right.

A. Siphon tube
B. Vent port
C. Siphon cup
D. Fluid volume control
E. Air control valve
F. Fluid inlet connection
G. Siphon cup assembly retainer
H. Air supply connection
I. Air cap
J. Fluid needle valve
K. Handle portion of body
L. Air cap retainer
M. Spray pattern width spread control
N. Air-fluid control trigger
O. Siphon cup seal
P. Fluid nozzle
Q. Siphon cup release lever

1. ____________________
1a. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
13. ____________________
14. ____________________
15. ____________________
16. ____________________
17. ____________________


1
1a
3
2
4
5
10
9
11
8
6
12
15
16
14
7
13
MATERIAL
AIR
AIR ADJUSTED TO CONTROL WIDTH OF SPRAY PATTERN

Module 7.0

STUDENT: ______________________________ DATE: ____________

PERFORMANCE TESTS:

1. Locate paint code

   a. Given three different makes of automobile, at least one of foreign manufacture, locate the manufacturer's paint code on the body ID tag/plate with 100 percent accuracy.

      COMPETENCY LEVEL: 0 ( )
      COMPETENCY LEVEL: 1 ( )
      COMPETENCY LEVEL: 2 ( )
      COMPETENCY LEVEL: 3 ( )
      COMPETENCY LEVEL: 4 ( )

   b. Given two vehicles to paint, the necessary support and references; determine the materials for the painting repair with an accuracy to the standards of the instructor.

      COMPETENCY LEVEL: 0 ( )
      COMPETENCY LEVEL: 1 ( )
      COMPETENCY LEVEL: 2 ( )
      COMPETENCY LEVEL: 3 ( )
      COMPETENCY LEVEL: 4 ( )

2. Prepare Metal Surfaces for Undercoating

Given a sheet metal panel with paint damage, all necessary tools, and materials; prepare the panel so it can be undercoated by (a) sanding one-half of the sheet metal to prepare it for lacquer and (b) using paint remover on the other half of the panel. A checklist will be used to rate competency and all items must receive acceptable rating. The instructor will state the time limit for the task based on the size of the job.

CHECKLIST

A	N	
( )	( )	1. Clean metal and apply precleaning solvent correctly.
( )	( )	2. Featheredging smooth 1/8 - 3/4 inch all around damaged area.
( )	( )	3. Sands remaining area with correct sandpaper for lacquer paint.
( )	( )	4. Treats metal correctly.
( )	( )	5. Uses enamel reducer correctly.
( )	( )	6. Accomplished task in stipulated time.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

A = Acceptable

N = Not acceptable

3. Mask Sections and Parts

Given a vehicle requiring masking, a service manual or masking specifications, masking materials, and necessary tools and other materials; prepare the vehicle for a complete paint job except for the hood. You must use reverse taping at least once. Mask all sections and parts to +/- 1/16 inch of specifications completing the task within flat rate time plus 50 percent. Process and product performance must be to instructor's standards. A checklist will be used to rate performance and all items must be rated acceptable.

CHECKLIST

A	N		
( )	( )	1.	Correct width tape and paper selected.
( )	( )	2.	Tape and paper applied to clean and dry surface.
( )	( )	3.	Lacquer applied to weatherstrip.
( )	( )	4.	Tape applied by acceptable techniques.
( )	( )	5.	Tape applied firmly and stretched tightly.
( )	( )	6.	Tape torn correctly.
( )	( )	7.	Pleats folded and taped.
( )	( )	8.	Masking applied along natural breaks.
( )	( )	9.	Use method of reverse taping correctly.
( )	( )	10.	Trim and lettering masked correctly.

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

A = Acceptable

N = Not acceptable

4. Clean, Adjust, and Use Spray Gun

Given a cardboard box, scrap sheet metal, or a panel; a spray gun, paint, and all necessary accessories and materials; paint the outside of the box-metal without using references, demonstrating the proper spray technique, without sags or runs. A checklist will be used to rate performance and all items must be rated acceptable.

CHECKLIST

These performance actions should be considered the minimum necessary for competency in cleaning, adjusting, and using the paint spray gun.

A	N		
( )	( )	1.	Spray gun assembled correctly.
( )	( )	2.	Spray gun adjusted correctly.
( )	( )	3.	Spray gun held correctly.
( )	( )	4.	Trigger used correctly.
( )	( )	5.	Paints in alternate strokes.
( )	( )	6.	Overlaps 50 percent.
( )	( )	7.	Painted surface without sags, runs, dry spray, or zebra effects.
( )	( )	8.	Banding performed correctly.
( )	( )	9.	Cornering performed correctly.
( )	( )	10.	Spray gun cleaned and stored properly.

A = Acceptable

N = Not acceptable

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

Adopted from Auto Body Repair, Charleston, WV: Vocational Curriculum Laboratory, State Department of Education, p. 46, 1979.

5. Apply Undercoating

Given a sheet metal panel or vehicle prepared for painting, paint gun, undercoating material, and all necessary supplies; prepare and apply the undercoat using only the manufacturer's directions for references and receiving a satisfactory rating on all items of a checklist used to evaluate competency.

CHECKLIST

A	N		
( )	( )	1.	Mixes correct primer-surfacer correctly.
( )	( )	2.	Allows proper time between coats of primer-surfacer.
( )	( )	3.	Primer-surfacer applied smoothly without sags, runs, or zebra effect.
( )	( )	4.	Applies paint putty correctly.
( )	( )	5.	Sands putty correctly.
( )	( )	6.	Compounds area correctly.
( )	( )	7.	Applies enamel reducer correctly.
( )	( )	8.	Dues and tasks area correctly.
( )	( )	9.	Mixes sealer correctly.
( )	( )	10.	Applies even medium coat of sealer to area.
( )	( )	11.	Scuffs and tacks sealer properly.

A = Acceptable

N = Not acceptable

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

6. Paint Vehicle or Panels

Given two sheet metal panels or a vehicle, masked, with all necessary undercoats, spray gun, paint, and all necessary materials; paint and finish the surface.* No references may be used and performance process and product must receive all acceptable ratings on a checklist. Finish must show no sags or runs.

*Two tasks are recommended: One using lacquer and the other using enamel.

CHECKLIST

A	N	
( )	( )	1. Mixes paint according to shop conditions.
( )	( )	2. Uses spray gun correctly.
( )	( )	3. Paints surface without defects.
( )	( )	4. Applies mist coat correctly.
( )	( )	5. Uses rubbing compound correctly.
( )	( )	6. Observes safety precautions.

A = Acceptable

N = Not acceptable

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

7. Match Color Paint

Given a painted panel or vehicle, prepared for painting, match the color and mix the paint for painting using a reference chart and color chips and using a spray gun. Color and paint must match to the standards of the instructor.

CHECKLIST

A	N	
( )	( )	1. Selects correct reducer-thinner according to shop conditions.
( )	( )	2. Mixes correct amount of reducer-thinner according to shop conditions.
( )	( )	3. Uses spray gun to match color correctly.
( )	( )	4. Uses reference chart to match color.
( )	( )	5. Color matched as close as possible (to instructor's standards).

A = Acceptable

N = Not acceptable

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

8. Given three vehicles that need to be painted, describe the temperature and time that are recommended for the paint to heat dry by baking. Recommendations must be in agreement with the instructor's recommendations, +/- to the instructor's standards (80 percent accuracy suggested).

a. Vehicle 1 ________________________________

________ temperature

________ time

b. Vehicle 2 ________________________________

________ temperature

________ time

c. Vehicle 3 ________________________________

________ temperature

________ time

MODULE 8.0

TRIM, ACCESSORIES, AND HARDWARE

This module is divided into two units. The first unit represents basic interior trim, accessories, and hardware tasks and the second unit is concerned with exterior trim, accessories, and hardware.

UNIT 8.0 A	TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)
UNIT 8.0 B	TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

UNIT 8.0 A

TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

AUTO BODY
TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Unit 8.0 A	TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)	
8.01	Remove and Replace Interior Molding	*
8.02	Remove and Replace Trim Panels	*
8.03	Remove and Replace a Padded Dashboard	*
8.04	Remove and Replace Seat and Shoulder Belts	*
8.05	Remove and Replace Front and Rear Seats	*
8.06	(OPTIONAL) Remove and Replace Seat Tracks	*
8.07	(OPTIONAL) Remove and Replace Power Seat Controls	*
	TOTAL	30

*Integrated training

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Unit 8.0 A	TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)
8.01	(Remove and Replace Interior Molding) Provided with a vehicle, service manual, and the necessary tools, equipment, and materials; remove and replace molding. Molding must be attached securely to the specified locations with the specified type and number of fasteners.
8.02	(Remove and Replace Trim Panels) On a given vehicle, using service manual, tools, equipment, and materials provided; remove and replace the trim panels. The watershield and remote mirror control must not be damaged in replacing the door trim panel, and interior trim must be replaced without damage to the panels or fasteners, push pins, or retainers. Trim panels must be attached securely with the specified type, color, and number of fasteners.
8.03	(Remove and Replace a Padded Dashboard) Given a vehicle with a padded dashboard, service manual, and the required tools, equipment, and material; remove and replace the dashboard. The replaced dashboard must be attached securely with the specified type, color, and number of fasteners. The interior trim and seats must not be damaged, and connections must be electrically and mechanically secure.
8.04	(Remove and Replace Seat and Shoulder Belts) On a given vehicle, using a service manual, provided with required tools, equipment, and materials; remove and replace the seat and shoulder belts of the vehicle. The seats and shoulder belts must connect with mating components and recoil the static position. The interior trim, seats, and restraints must not be damaged. If the seat or shoulder belts contain electrical sensing/warning devices, the electrical connections must be properly disconnected and reconnected so that the electrical circuits function as intended.
8.05	(Remove and Replace Front and Rear Seats) On a given vehicle, following manufacturer's recommendations and using tools, equipment, and materials supplied; remove and replace front and rear seats of the vehicle as required. Seats must be removed without damage to upholstery, interior trim, or

fasteners. Installed seats must be securely fastened in position and, if adjustable, must operate as intended.

8.06 (Remove and Replace Seat Tracks) Provided with a vehicle with manually adjustable seats and given the necessary tools, equipment, and materials; remove and replace seat tracks according to available manufacturer's service information. The seat must release, slide, and lock on both tracks simultaneously.

8.07 (Remove and Replace Power Seat Controls) Provided with a vehicle equipped with power seats, service manual, electrical wiring diagram, required test equipment, tools, equipment, and materials; remove and replace the power seat controls. Wiring must be removed without damage and replaced wiring must be according to the wiring diagram with no breaks in wire insulation or damage to connectors and the circuit must be free of electrical hazards. Connections must be mechanically and electrically secure, and the adjustment control must operate to manufacturer's specifications.

UNIT 8.0 A TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

TASK 8.01 REMOVE AND REPLACE INTERIOR MOLDING

PERFORMANCE OBJECTIVE:

Provided with a vehicle, service manual, and the necessary tools, equipment, and materials; remove and replace moldings. Moldings must be attached securely to the specified locations with the specified type and number of fasteners.

PERFORMANCE ACTIONS:

8.0101 Identify moldings to be removed, how fastened, steps in removal, etc.

8.0102 Assemble necessary tools.

8.0103 Remove hardware and upholstery as necessary.

8.0104 Locate clips and fasteners securing molding.

8.0105 Remove damaged molding.

8.0106 Install clips and fasteners as required to replace molding.

8.0107 Install replacement molding.

8.0108 Install hardware and upholstery.

PERFORMANCE STANDARDS:

- Remove and replace moldings so that installed moldings are attached securely to specified locations with required type and number of fasteners.
- Removal and replacement must not result in damage to vehicle.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of molding tools.
- Identify fasteners and adhesives used on moldings.
- Describe/demonstrate procedures for removing and replacing:
    - (a) interior trim garnish
    - (b) window molding
    - (c) windshield and rear glass molding
    - (d) door molding
    - (e) body shell molding
- Identify safety considerations.

TASK 8.02 REMOVE AND REPLACE TRIM PANELS

PERFORMANCE OBJECTIVE:

On a given vehicle, using service manual, tools, equipment, and materials provided; remove and replace the trim panels. The watershield and remote mirror control must not be damaged in replacing the door trim panel, and interior trim must be replaced without damage to the panels or fasteners, push pins, or retainers. Trim panels must be attached securely with the specified type, color, and number of fasteners.

PERFORMANCE ACTIONS:

8.0201 Remove and replace trim panels according to manufacturer's shop manual.

PERFORMANCE STANDARDS:

- Remove and replace trim panels on doors, etc., so that replacement does not result in damage to trim panels, fasteners, push pins, or retainers.
- Watershield and remote mirror control must not be damaged.
- Trim panels must be attached securely with specified type, color, and number of fasteners.
- Performance product must be to instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify and demonstrate use of door handle tools.
- Identify types of fasteners used for trim panels.
- Describe water and dust considerations.
- Describe/demonstrate procedure for removing and installing the following typical panels:
    (a) center pillar
    (b) cowl side
    (c) door
    (d) roof side
    (e) package tray trim

UNIT 8.0 A

TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

TASK 8.03

REMOVE AND REPLACE A PADDED DASHBOARD

PERFORMANCE OBJECTIVE:

Given a vehicle with a padded dashboard, service manual, and the required tools, equipment, and material; remove and replace the dashboard. The replaced dashboard must be attached securely with the specified type, color, and number of fasteners. The interior trim and seats must not be damaged, and connections must be electrically and mechanically secure.

PERFORMANCE ACTIONS:

8.0301 Remove dashboard according to manufacturer's manual. (Typically, auto body training will omit task that require extensive removal and replacement of electrical wiring.)

PERFORMANCE STANDARDS:

- Remove and replace a padded dashboard.
- The installed dashboard must be attached securely with the specified type, color, and number of fasteners.
- The interior trim and seats must not be damaged, and connections must be electrically and mechanically secure.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify various dashboard fasteners.
- Identify/demonstrate use of specialized hand and power tools required in task.
- Describe/demonstrate procedures for disconnecting and connecting dashboard electrical circuits.
- Describe/demonstrate dashboard removal and replacement procedures.
- Explain safety consideration.

UNIT 8.0 A TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

TASK 8.04 REMOVE AND REPLACE SEAT AND SHOULDER BELTS

PERFORMANCE OBJECTIVE:

On a given vehicle, using a service manual, provided with required tools, equipment, and materials; remove and replace the seat and shoulder belts of the vehicle. The seats and shoulder belts must connect with mating components and recoil the static position. The interior trim, seats, and restraints must not be damaged. If the seat or shoulder belts contain electrical sensing/warning devices, the electrical connections must be properly disconnected and reconnected so that the electrical circuits function as intended.

PERFORMANCE ACTIONS:

8.0401 Review service manual concerning removal of:

- a. Lap belt retractor, etc.
- b. Shoulder belt retractor, etc.
- c. Electrical warning system.

8.0402 Remove safety belt anchoring bolts at points where safety belts go through seat assembly or are attached to vehicle.

8.0403 Follow manufacturer's procedures for removal of electrical warning system connections.

8.0404 Remove safety belts according to recommended procedures.

8.0405 Install safety belts according to recommended procedures.

8.0406 Check replaced belts for:

- a. Properly mated components, securely fastened.
- b. Proper recoil to static position, as applicable.
- c. Electrical sensing/warning system functioning properly.
- d. Safety belt system operating as intended.

TASK 8.04 REMOVE AND REPLACE SEAT AND SHOULDER BELTS (Con't.)

PERFORMANCE STANDARDS:

- Remove and replace seat and shoulder belts so that finish installation connects with mating components and recoils to the static position.
- The interior trim, seats, and restraints must not be damaged.
- Electrical circuits connected to seat or shoulder belts must function as intended.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of seat belt replacement tools.
- Describe operation of safety belt system.
- Describe operation of electrical circuits in safety belt system, referring to service manual as necessary.
- Describe/demonstrate procedure for replacing seat and shoulder belts and, as applicable, disconnecting and connecting electrical warning circuits.
- Identify safety considerations.

UNIT 8.0 A — TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

TASK 8.05 — REMOVE AND REPLACE FRONT AND REAR SEATS

PERFORMANCE OBJECTIVE:

On a given vehicle, following manufacturer's recommendations and using tools, equipment, and materials supplied; remove and replace front and rear seats of the vehicle as required. Seats must be removed without damage to upholstery, interior trim, or fasteners. Installed seats must be securely fastened in position and, if adjustable, must operate as intended.

PERFORMANCE ACTIONS:

8.0501 Check manufacturer's service manual concerning method by which seats are fastened in vehicle.

REAR SEATS:

8.0502 Typically, force rear seat cushion down and to rear, disengaging it from retainers.

8.0503 Lift and move cushion forward until it can be removed from vehicle. Turn the seat vertically if necessary to remove it through a rear door or, on two door models, through door opposite driver's side. (See service manual for rear arm rest models.)

8.0504 Remove rear seat back rest by removing retaining bolts, allowing bottom to move forward and lifting up on rear top to disengage top hanger brackets.

8.0505 Remove rear seat back rest from vehicle.

8.0506 Protect upholstery by placing seats in a clean, dry protected area.

FRONT SEATS:

8.0507 Because of the variety of front seats, check the service manual for recommended procedures.

8.0508 Locate retaining bolts or fasteners.

8.0509 Move seat rearward to maximum position.

8.0510 Disconnect bolts and nuts as applicable.

PERFORMANCE ACTIONS (Con't.):

8.0511 Disconnect electrical circuits connected to front seats.

8.0512 Move seat forward to maximum position, using assistant, lift seat from vehicle.

8.0513 INSTALL REAR AND FRONT SEATS BY REVERSING TASKS OR BY RECOMMENDED PROCEDURES.

PERFORMANCE STANDARDS:

- Remove and replace front and rear seats on a given vehicle following recommended procedures and so that no damage results to seat upholstery or interior trim or fasteners.
- Seats should not be soiled during removal and replacement process or during storage.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

UNIT 8.0 A — TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

TASK 8.06 (Optional) — REMOVE AND REPLACE SEAT TRACKS

PERFORMANCE OBJECTIVE:

Provided with a vehicle with manually adjustable seats and given the necessary tools, equipment, and materials; remove and replace seat tracks according to available manufacturer's service information. The seat must release, slide, and lock on both tracks simultaneously.

PERFORMANCE ACTIONS: (See manufacturer's manual.)

PERFORMANCE STANDARDS:

- Remove and replace seat tracks on manually adjustable seats in a given vehicle so that the seat(s) release, slide, and lock on both tracks simultaneously.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Describe operation of manual seat adjustment mechanism.
- Describe/demonstrate procedure for track removal, replacement, and alignment.
- Identify safety considerations.

UNIT 8.0 A

TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)

TASK 8.07 (Optional)

REMOVE AND REPLACE POWER SEAT CONTROLS

PERFORMANCE OBJECTIVE:

Provided with a vehicle equipped with power seats, service manual, electrical wiring diagram, required test equipment, tools, equipment, and materials; remove and replace the power seat controls. Wiring must be removed without damage and replaced wiring must be according to the wiring diagram with no breaks in wire insulation or damage to connectors and the circuit must be free of electrical hazards. Connections must be mechanically and electrically secure, and the adjustment control must operate to manufacturer's specifications.

PERFORMANCE ACTIONS: (See manufacturer's manual.)

PERFORMANCE STANDARDS:

- Remove and replace power seat controls so that no damage occurs to wire or connectors and so system is free of electrical hazards and operates as intended.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Describe operation of multidirectional power seat mechanism and control.
- Describe/demonstrate replacement procedure for power seat controls.
- Identify safety considerations.
- Color Code Book (manufacturer's manual) on vehicle.

Module 8.0 - Unit 8.0 A

STUDENT: ______________________________ DATE: ______________

PERFORMANCE TESTS:

1. Demonstrate the proper use of hand tools and the correct techniques in removing and replacing interior molding and trim on an automobile. There must be no damage to surrounding parts of the vehicle and performance must meet the instructor's standards.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

2. Remove and replace seat and shoulder belts on a given automobile. Performance must be to manufacturer's specifications and the instructor's standards.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

3. Remove and replace front and rear seats in an automobile following manufacturer's recommended steps and meeting the instructor's standards.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

4. Remove and replace power seat controls at the seat, correctly tagging and matching wire connections, making secure mechanical and electrical connections, and not damaging surrounding parts. Installed controls must operate properly and performance must be to the instructor's standards.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

UNIT 8.0 B

TRIM, ACCESSORIES, AND HARDWARE
(EXTERIOR)

AUTO BODY
TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)
SUGGESTED INSTRUCTION TIMES

AUTO BODY UNIT/TASK		SUGGESTED HOURS
Unit 8.0 B	TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)	
8.01	Remove, Replace, and Align Door Locks and Mating Parts	6
8.02	Remove, Replace, and Align a Trunk Lock and Mating Parts	3
8.03	Remove, Replace, and Align Hood Latch and Mating Parts	4
8.04	Remove and Install Weatherstripping	3
8.05	Remove and Replace a Bumper	6
8.06	Remove and Replace a Grille	6
8.07	Remove and Replace a Vinyl Top	3
8.08	Remove/Replace Sun Roof or T-Roof Assembly	*
	TOTAL	31

*Integrated training

TASK LISTINGS
AUTO BODY

UNIT/TASK	DESCRIPTION
Unit 8.0 B	TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)
8.01	(Remove, Replace, and Align Door Locks and Mating Parts) Given a vehicle, service manual, door lock set, door handle tools, and the necessary tools, equipment, and materials; remove, replace, and align the door locks and mating parts. Door locks must be operational and mate with striker plates.
8.02	(Remove, Replace, and Align a Trunk Lock and Mating Parts) Provided with a vehicle, service manual, trunk lock set, and the necessary tools, equipment, and materials; remove, replace, and align the trunk lock and its mating parts. The trunk lock must open and close smoothly and quietly, with no damage to adjacent panels.
8.03	(Remove, Replace, and Align Hood Latch and Mating Parts) Given a vehicle, hood latch set, and the required tools, equipment, and materials; remove, replace, and align the hood latch and mating parts. The hood latch must be operational and mate with the striker plate. The hood must open and close smoothly and quickly with no damage to the hood or front end.
8.04	(Remove and Install Weatherstripping) Provided with a vehicle with weatherstripping attached, and the necessary tools, equipment, and materials; replace the weatherstripping. Surface preparation must ensure secure bonding. The replaced weatherstripping must not interfere with the opening, closing, or locking of the doors or trunk, as applicable. There must be no air or water leaks.
8.05	(Remove and Replace a Bumper) Given a vehicle, a replacement bumper, and the necessary tools, equipment, materials, and instruction (service manual); remove and replace the bumper. The bumper assembly must be mounted securely with the specified type, size, and number of fasteners. Distances across and around the face bar must be equal. The face bar, reinforcement, and energy absorbers must not be damaged.
8.06	(Remove and Replace a Grille) Given a vehicle with grille and gravel deflector to be replaced, service manual, and the necessary tools, equipment, and

materials; remove and replace the grille and gravel deflector. The replaced grille must be attached securely, properly aligned, and free of scratches. The specified type, color, and number of fasteners must be used. No damage to the exterior trim or the vehicle must be caused.

8.07 (Remove and Replace a Vinyl Top) Given an automobile with a vinyl top, a heat gun, orbital sander, vinyl adhesive, cleaning solvents, replacement vinyl material (if required), and the necessary tools, equipment, and materials; detach and reglue or remove and replace a vinyl top section. The surface area must be free of all foreign matter. The reglued vinyl must be attached securely and be free of air pockets, wrinkles, and tears. All trim must be mounted securely. The task must be completed to the satisfaction of the instructor.

8.08 (Remove/Replace Sun Roof or T-Roof Assembly) Given a vehicle with a sun roof panel or T-roof assembly, replacement parts, tools, equipment, and materials including manufacturer's manual; remove and replace the given sun roof panel or T-roof to the instructor's standards.

UNIT 8.0 B
TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.01
REMOVE, REPLACE, AND ALIGN DOOR LOCKS AND MATING PARTS

PERFORMANCE OBJECTIVE:

Given a vehicle, service manual, door lock set, door handle tools, and the necessary tools, equipment, and materials; remove, replace, and align the door locks and mating parts. Door locks must be operational and mate with striker plates. Doors must open and close smoothly and quietly with no damage to the door and rocker panel.

PERFORMANCE ACTIONS: (See manufacturer's manual.)

PERFORMANCE STANDARDS:

- Remove, replace, and align door locks and mating parts on a given vehicle so that door locks are operational and mate with striker plates and so that doors open and close smoothly and quietly with no damage to the door and rocker panel.

SUGGESTED INSTRUCTION TIME: 6 Hours

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of pin and clip removing tools and special tools for removing door locks.

TASK 8.02 REMOVE, REPLACE, AND ALIGN A TRUNK LOCK AND MATING PARTS

PERFORMANCE OBJECTIVE:

Provided with a vehicle, service manual, trunk lock set, and the necessary tools, equipment, and materials; remove, replace, and align the trunk lock and its mating parts. The trunk lock must be operational and mates with the striker plate. The trunk must open and close smoothly and quietly, with no damage to adjacent panels.

PERFORMANCE ACTIONS: (See manufacturer's manual.)

PERFORMANCE STANDARDS:

- Remove, replace, and align a trunk (rear compartment) lock and mating parts so that the lock is operational and mates with the striker plate and so that the trunk opens and closes smoothly and quietly, with no damage to adjacent panels.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of trunk lock tools.
- Explain operation of trunk locks and striker plate.
- Describe/demonstrate procedure for removing, replacing, and aligning trunk locks and mating parts.
- Identify safety considerations.

UNIT 8.0 A | TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.03 | REMOVE, REPLACE, AND ALIGN HOOD LATCH AND MATING PARTS

PERFORMANCE OBJECTIVE:

Given a vehicle, hood latch set, and the required tools, equipment, and materials; remove, replace, and align the hood latch and mating parts. The hood latch must be operational and mate with the striker plate. The hood must open and close smoothly and quickly with no damage to the hood or front end.

PERFORMANCE ACTIONS:

8.0301 Inspect hood latch and mating parts, select necessary tools.

8.0302 Remove latch and mating parts following service manual.

8.0303 Replace latch and mating parts by recommended procedures.

8.0304 Locate adjustment points.

8.0305 Make adjustments necessary to secure proper alignment and operation.

PERFORMANCE STANDARDS:

- Remove, replace, and align a hood latch and mating parts so the hood latch and mating parts are operational and so that the hood opens and closes smoothly and quietly without damage to the hood or front end.

SUGGESTED INSTRUCTION TIME: 4 Hours

RELATED TECHNICAL INFORMATION:

- Identify tools used to remove, replace, align hood latch.
- Describe operation of latches and striker plates.
- Describe/demonstrate procedure for removing, replacing, and aligning hood latches and mating parts.
- Identify safety considerations.

UNIT 8.0 B — TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.04 — REMOVE AND INSTALL WEATHERSTRIPPING

PERFORMANCE OBJECTIVE:

Provided with a vehicle with weatherstripping attached, and the necessary tools, equipment, and materials; replace the weatherstripping. Surface preparation must ensure secure bonding. The replaced weatherstripping must not interfere with the opening, closing, or locking of the doors or trunk, as applicable. There must be no air or water leaks.

PERFORMANCE ACTIONS:

8.0401 Identify location where weatherstripping is to be removed and replaced.

8.0402 Check service manual concerning type of fasteners or adhesive used.

8.0403 Remove weatherstripping following manufacturer's recommended procedures.

8.0404 Install weatherstripping following service manual and, if adhesive is used, following adhesive manufacturer's directions.

PERFORMANCE STANDARDS:

- Remove and replace weatherstripping on a given vehicle causing no damage to fasteners or adhesive used and resulting in no damage to the weatherstripping or vehicle finish.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Identify and demonstrate use of fastening tool (retainer removing tool, putty knife to break adhesive bond, etc.).
- Identify adhesives and fasteners used for weatherstripping.
- Describe/demonstrate installation procedure for adhesive type weatherstripping.
- Describe/demonstration installation and fastening procedure for weatherstripping.
- Identify safety considerations.

UNIT 8.0 B TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.05 REMOVE AND REPLACE A BUMPER

PERFORMANCE OBJECTIVE:

Given a vehicle, a replacement bumper, and the necessary tools, equipment, materials, and instruction (service manual); remove and replace the bumper. The bumper assembly must be mounted securely with the specified type, size, and number of fasteners. Distances across and around the face bar must be equal. The face bar, reinforcement, and energy absorbers must not be damaged.

PERFORMANCE ACTIONS: (Impact-absorbing bumpers)

8.0501 Review service manual concerning removing the bumper face bar from the energy absorber (reinforcing bar).

8.0502 From under the vehicle, disconnect any lighting wires or attachments running to the bumper.

8.0503 Remove the bumper nuts and bolts.

8.0504 Hold bumper (with helper as necessary) while removing last several bolts.

8.0505 With helper, remove complete bumper assembly from vehicle.

8.0506 Place bumper face down on work surface.

8.0507 Check bolt holes on each absorber unit to ensure they are not damaged. Check for frame damage.

8.0508 Set replacement bumper next to old bumper.

8.0509 Transfer undamaged parts from old bumper to replacement bumper.

8.0510 Install bumper guards properly, if applicable.

8.0511 With helper, install replacement bumper on vehicle leaving energy absorber bolts (mounting bracket bolts on fixed bumper) loose to allow for adjustment.

8.0512 Adjust bumper to specifications (correct, even fit).

PERFORMANCE STANDARDS:

- Remove and replace a bumper (impact-absorbing bumper) with the specified type, size, and number of fasteners used to securely mount the bumper assembly.
- Distances across and around the face bar must be equal.
- The face bar, reinforcements, and energy absorbers must not be damaged.

SUGGESTED INSTRUCTION TIME: 6 Hours

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of:
  - (a) mechanics tools
  - (b) power driven tools
  - (c) punches
  - (d) measuring devices (tapes)
- Identify and explain functions of:
  - (a) face bar
  - (b) back bar
  - (c) energy absorber
  - (d) fasteners
  - (e) impact strips
- Describe bumper removal and replacement procedures.
- Describe bumper alignment and adjustment procedures.
- Safety.
- Proper use of helper.

EXPANSION OF TASK:

1. ALIGNMENT OF BUMPER REINFORCEMENTS

PERFORMANCE OBJECTIVE:

Given a vehicle with misaligned bumper reinforcements, service manual, press, and the necessary tools, equipment, and materials; align the bumper reinforcements. The reinforcements must be in alignment with the face bar to manufacturer's specifications.

PERFORMANCE ACTIONS:

As recommended in manufacturer's service manual.

EXPANSION OF TASK (Con't.):

PERFORMANCE STANDARDS:

- As outlined in objective.

SUGGESTED INSTRUCTION TIME: (Optional)

RELATED TECHNICAL INFORMATION:

- Identify types of bumper reinforcements.
- Describe/demonstrate use of a press (if available).
- Describe procedures for removing, aligning, and replacing a bumper reinforcement.
- Safety.

2. ALIGN ENERGY ABSORBERS

PERFORMANCE OBJECTIVE:

Given a vehicle with damaged energy absorbers, a press, and the necessary tools, equipment, and materials, align the energy absorbers. The front plate on the absorbers must be in alignment with the reinforcement bar, and the energy absorbers must operate as intended by the manufacturer's service manual.

PERFORMANCE ACTIONS:

As recommended in manufacturer's service manual.

PERFORMANCE STANDARDS:

- As outlined in objective.

SUGGESTED INSTRUCTION TIME: (Optional)

RELATED TECHNICAL INFORMATION:

- Identify types of energy absorbers.
- Explain function and operation of energy absorbers.
- Describe types of damage that require repair or replacement of energy absorbers.
- Describe procedure for removing, aligning, and replacing energy absorbers.
- Safety.

UNIT 8.0 B — TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.06 — REMOVE AND REPLACE A GRILLE

PERFORMANCE OBJECTIVE:

Given a vehicle with grille and gravel deflector to be replaced, service manual, and the necessary tools, equipment, and materials; remove and replace the grille and gravel deflector. The replaced grille must be attached securely, properly aligned, and free of scratches. The specified type, color, and number of fasteners must be used. No damage to the exterior trim of the vehicle must be caused.

PERFORMANCE ACTIONS: (See manufacturer's shop manual.)

PERFORMANCE STANDARDS:

- Remove and replace a grille (and gravel deflector) on a given vehicle so that the finished product is securely attached, properly aligned, and free of any damage.

SUGGESTED INSTRUCTION TIME: 6 Hours

RELATED TECHNICAL INFORMATION:

- Identify grille fasteners.
- Describe/demonstrate grille removal and replacement procedures.
- Describe grille alignment and adjustment procedures.
- Safety.
- Identify gravel deflectors.

UNIT 8.0 B TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.07 REMOVE AND REPLACE A VINYL TOP

PERFORMANCE OBJECTIVE:

Given an automobile with a vinyl top, a heat gun, orbital sander, vinyl adhesive, cleaning solvents, replacement vinyl material (if required), and the necessary tools, equipment, and materials; detach and reglue or remove and replace a vinyl top section. The surface area must be free of all foreign matter. The reglued vinyl must be attached securely and be free of air pockets, wrinkles, and tears. All trim must be mounted securely. The task must be completed to the satisfaction of the instructor.

PERFORMANCE ACTIONS:

8.0701 Remove and replace or repair a vinyl top according to the vehicle or product manufacturer's procedures and specifications and under the supervision of the instructor.

PERFORMANCE STANDARDS:

- Remove and replace, or detach and reglue, a vinyl top section.
- The surface area must be free of all foreign matter.
- The reglued vinyl must be attached securely and be free of air pockets, wrinkles, and tears.
- All trim must be mounted securely.
- The task must be completed to the satisfaction of the instructor.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Describe how to detach a vinyl roof section.
- Identify types of material used for vinyl top covering.
- Identify: Cleaning solvents
  Sandpaper type
  Vinyl adhesives used for vinyl top repair
- Describe procedure for cleaning and sanding the top surface before regluing a vinyl top section.
- Describe procedure for detaching and regluing a vinyl top.
- Describe how to remove wrinkles and air bubbles.
- Identify safety considerations.

UNIT 8.0 B TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)

TASK 8.08 (Optional) REMOVE/REPLACE SUN ROOF OR T-ROOF ASSEMBLY

PERFORMANCE OBJECTIVE:

Given a vehicle with a sun roof panel or T-roof assembly, replacement parts, tools, equipment, and materials including manufacturer's manual; remove and replace the given sun roof panel or T-roof to the instructor's standards.

PERFORMANCE ACTIONS:

See: Rhone and Yates, Total Auto Body Repair, Indianapolis, IN: Bobbs-Merrill Educational Publishing, pp. 359-366, 1983, or other publications which include visuals of sun roofs and T-roofs.

See also, manufacturer's manual.

PERFORMANCE STANDARDS:

- Remove, repair, and replace a given sun roof or T-roof so that any movable parts function as intended and so no leaks result and so no damages occurs to surrounding parts and panels.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Describe basic sun roof operation.
- Describe vent-type sun roof:
    - Motorized panel
    - Lift-off panels (T-roof)
    - Manually raised unit

Module 8.0 - Unit 8.0 B

STUDENT: ______________________________ DATE: _______________

1. Vinyl tops are held in place by the use of ____.

____ a. rivets
b. moldings
c. adhesive
d. paint

2. Some vinyl tops have a pad between the outer covering and ____.

____ a. the paint
b. the metal roof
c. headlining
d. the drip rails

3. The failure of vinyl roofs is usually caused by ____.

____ a. rust under the cover
b. vinyl roof has not been waxed
c. lack of paint on vinyl
d. not keeping it clean

4. Exterior trim moldings and pieces often are made of ____.

____ a. stamped aluminum, stamped stainless steel or plastic
b. enamel, pressed chrome, or cast iron
c. extruded brass, body lead, or asbetos
d. all of the above

5. Quarter and door panels usually are made of ____.

____ a. fiberglass
b. die-cast plated aluminum
c. aluminum tape and caulking
d. self-retaining moldings

TRUE OR FALSE: Circle your answer in the space provided.

6. Some trim moldings are simply glued onto the vehicle. T F

7. The most durable automobile trim material is stamped stainless steel. T F

8. The listing wires in headlines are used to beautify the interior. T F

9. New vinyl top covers are cemented in place by working from the center line outward, on one side at a time. T F

10. The stamped stainless steel moldings that fit around the back light or windshield are known as assembly moldings. T F

STUDENT: ______________________________ DATE: _____________

PERFORMANCE TESTS:

1. Given sheet metal or vehicles requiring both straight line and curved pinstriping, paint the pinstripes using striping tape or apply adhesive pinstriping tape so that the finished product is to manufacturer's standards, is positioned correctly, straight, and shows no wrinkles, air bubbles, or other imperfections. Task must be accomplished in flat rate time plus 50 percent.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

2. Given a vehicle which requires the replacement of a woodgrain panel(s); remove the old panel and replace it with a new panel correctly positioned with no air bubbles, wrinkles, or imperfections visible and all trim replaced correctly. The task should be accomplished in the flat rate time plus 50 percent.

   COMPETENCY LEVEL: 0 ( )
   COMPETENCY LEVEL: 1 ( )
   COMPETENCY LEVEL: 2 ( )
   COMPETENCY LEVEL: 3 ( )
   COMPETENCY LEVEL: 4 ( )

MODULE 9.0

DISASSEMBLE & ASSEMBLE PANELS, ETC.
(Remove and Replace)

This unit is designed to introduce the secondary student to the disassembly and assembly of major body panels such as fenders, decks, etc.; however, this unit involves advanced skills which probably will be mastered only through additional training at the post-secondary level or on-the-job.

Tasks that have been omitted in this initial articulated instruction guide include:

- Remove, align, and replace unitized weld-on panel.
- Determine unitized body shell alignment.
- Align unitized body shell.
- Remove and replace rack and pinion steering assembly.
- Align rack and pinion steering assembly.

These and other tasks may be included after this guide is field-trial tested and revised.

STANDARDS

- In remove and replace operations, where applicable, label all wiring, vacuum hoses, etc., so that they may be replaced correctly.
- Make sure no wiring or other important functions are interrupted unless removed.
- Check all wiring and related functions when connections have been made.
- Make sure all fasteners are replaced and tightened.
- Check alignment of panels on installation. Adjustments of doors, hood, and deck should be without the use of body shims if at all possible.
- Take care to avoid damage to panels removed and that will be repaired and placed back on vehicle.
- Check surrounding finish for damage on removing and installing panels.
- Doors, hood, and deck lids should open and shut without drags.
- Doors, deck lids should properly seal when replaced.
- Lock and opening functions should operate as designed and according to manufacturer's specifications.

AUTO BODY
DISASSEMBLE AND ASSEMBLE PANELS, ETC.
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 9.0	DISASSEMBLE AND ASSEMBLE PANELS, ETC.	
9.01	Remove and Install Door	*
9.02	Remove and Replace Bolt-on Panel	*
9.03	Remove and Replace Weld-on Panel	*
9.04	Remove and Replace and Align Hood and Deck Lids	*
9.05	(OPTIONAL) Remove a Complete Front End Assembly	*
9.06	Remove and Replace Bolt-in Radiator Supports	*
9.07	Remove and Replace Headlamp Assembly	*
9.08	(OPTIONAL) Remove and Replace Fuel Tank	*
	TOTAL	44

*Integrated training

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 9.0	DISASSEMBLE AND ASSEMBLE PANELS, ETC.
9.01	(Remove and Install Door) Provided with a vehicle requiring door replacement, a replacement door, and the necessary tools, equipment, and materials; remove damaged door and install the replacement. The replacement door must be properly aligned between the adjacent door, panel, etc., as compared with adjacent side of car.
9.02	(Remove and Replace Bolt-on Panel) Given a vehicle with bolt-on panels, manufacturer's manuals, replacement panel if required, and the necessary tools, equipment, replacement hardware, and materials; remove and replace the bolt-on panel. The replaced panel must be securely attached using the specified type, size, and number of fasteners and must be aligned with adjacent panels. No damage should be caused to adjacent panels.
9.03	(Remove and Replace Weld-on Panel) Given a vehicle requiring removal and replacement of a weld-on panel, welding station, welding accessories, grinders, body clamps, personal safety equipment, and the necessary tools, equipment, and materials; remove and replace the weld-on panel. The replaced panel must align with adjacent panels and be welded securely without warpage. The surface finish of all joints must be ground and filled to conform to the surrounding surface with no damage to adjacent panels.
9.04	(Remove and Replace and Align Hood and Deck Lids) Given an automobile requiring hood or deck lid replacement or adjustment, replacement hood or deck as needed, and the necessary tools, equipment, and materials; remove and replace the hood or deck lid so it lines up with the fenders or quarter panels according to standards of the instructor.
9.05	(Remove a Complete Front End Assembly) Given a vehicle requiring removal and replacement of the front end assembly, replacement parts if required, and the necessary tools, equipment, and materials; remove, repair, and replace the front end parts according to the manufacturer's specifications and the instructor's standards.

9.06 (Remove and Replace Bolt-in Radiator Supports) Given a vehicle which requires the removal and replacement of bolt-in radiator supports, replacement supports and hardware, and the necessary tools, equipment, and materials; remove and replace the support according to the manufacturer's specifications and instructor's standards.

9.07 (Remove and Replace Headlamp Assembly) Given a headlamp assembly mounted in a vehicle or front end assembly, replacement parts as required, tools, equipment, and materials; remove and replace the headlamp assembly so that the replaced assembly operates correctly and is aligned according to the manufacturer's specifications. The headlamp must be aligned to proper state inspection specifications.

9.08 (Remove and Replace Fuel Tank) Given a vehicle requiring replacement of fuel tank, remove and replace fuel tank. If tank is leaking, under supervision of instructor, clean hole and solder, brass patch, and reinstall tank.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.01 REMOVE AND INSTALL DOOR

PERFORMANCE OBJECTIVE:

Provided with a vehicle requiring door replacement, a replacement door, and the necessary tools, equipment, and materials; remove damaged door and install the replacement. The replacement door must be properly aligned between the adjacent door, panel, etc., as compared with adjacent side of car.

PERFORMANCE ACTIONS:

9.0101 Inspect damaged door.

9.0102 Assemble tools, equipment, materials, and replacement door.

9.0103 Remove inside hardware and trim from damaged door.

9.0104 Remove door glass, regulators, and guides.

9.0105 Remove all door lock mechanisms.

9.0106 Remove outside door handle and lock cylinder.

9.0107 Remove all weatherstripping.

9.0108 Install all hardware, weatherstripping, trim, and accessories on new door shell.

9.0109 Sound proof new door with undercoating.

9.0110 Install and align new door.

9.0111 Align and drill holes from trim molding.

PERFORMANCE STANDARDS:

- Remove and install a replacement door on a given vehicle so the new door is aligned properly with adjacent door, panel, etc., and so original appearance is retained.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

MODULE 9.0 — DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.01 — REMOVE AND INSTALL DOOR (Con't.)

EXPANSION OF TASK:

- Remove and replace a door panel so that it is restored to its original shape and dimensions. Remove door skin and related accessories, repair any defects in door frame before skin is replaced, reassemble door, reinstall door and check for proper fit and alignment before spot welding panel in permanent position. Finish door and check for contour and dimensional alignment.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.02 REMOVE AND REPLACE BOLT-ON PANEL

PERFORMANCE OBJECTIVE:

Given a vehicle with bolt-on panels, manufacturer's manuals, replacement panel if required, and the necessary tools, equipment, replacement hardware, and materials; remove and replace the bolt-on panel. The replaced panel must be securely attached using the specified type, size, and number of fasteners and must be aligned with adjacent panels. No damage should be caused to adjacent panels.

PERFORMANCE ACTIONS:

9.0201 Remove and replace a bolt-on panel.

PERFORMANCE STANDARDS:

- Remove and replace a bolt-on panel using the proper type, size, and number of fasteners and aligning the panel with adjacent panels and causing no damage to adjacent panels.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify panel replacement tools and equipment.
- Demonstrate proper use of panel replacement tools and equipment.
- Identify fasteners used for bolt-on panels.
- Describe bolt-on panel replacement procedures.
- Describe bolt-on panel alignment and adjustment procedures.

EXPANSION OF TASK:

- Check for related damage.
- Check for hidden damage.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.03 REMOVE AND REPLACE WELD-ON PANEL

PERFORMANCE OBJECTIVE:

Given a vehicle requiring removal and replacement of a weld-on panel, welding station, welding accessories, grinders, body clamps, personal safety equipment, and the necessary tools, equipment, and materials; remove and replace the weld-on panel. The replaced panel must align with adjacent panels and be welded securely without warpage. The surface finish of all joints must be ground and filled to conform to the surrounding surface with no damage to adjacent panels.

PERFORMANCE ACTIONS:

9.0301 Remove and replace weld-on panel.

PERFORMANCE STANDARDS:

- Remove and replace weld-on panel so it is aligned with adjacent panels and welded securely without warpage and so the surface finish of all joints is ground and filled to conform to surrounding surfaces with no damage to adjacent panels.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify and demonstrate use of clamping devices.
- Demonstrate welding techniques for panel replacement.
- Demonstrate use of grinders.
- Describe panel replacement procedures.
- Describe panel alignment procedures.
- Identify safety considerations.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.04 REMOVE AND REPLACE AND ALIGN HOOD AND DECK LIDS

PERFORMANCE OBJECTIVE:

Given an automobile requiring hood or deck lid replacement or adjustment, replacement hood or deck as needed, and the necessary tools, equipment, and materials; remove and replace the hood or deck lid so it lines up with the fenders or quarter panels according to standards of the instructor.

PERFORMANCE ACTIONS:

9.0401 Inspect hood or deck panel and determine if it is to be repaired or replaced.

9.0402 Remove hood panel if necessary.

9.0403 Replace hood panel if necessary.

9.0404 Inspect alignment points.

9.0405 Select proper tools.

9.0406 Make adjustments necessary to secure alignment with adjacent panels.

(NOTE: If repairs are to be made to hood, number 2 action will be to make proper repairs.)

PERFORMANCE STANDARDS:

- Remove and replace and align hood and deck lids so it lines up with the fenders or quarter panels according to standards of the instructor and meets specifications of the manufacturer.
- The hinge and latch adjustments must allow for smooth opening and closing.
- Hood and deck panel clearance must be equal on all surrounding panels with no damage caused to adjacent surfaces.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify hood and deck replacement tools and equipment.
- Demonstrate proper use of hood and deck replacement tools and equipment.
- Identify adjustment points on hood and deck panels.
- Describe types of hood and deck panel misalignment.
- Describe hood and deck panel removal and replacement procedures.
- Describe hood and deck panel alignment procedures.
- Identify shims.
- Identify brackets.
- Describe adjustment of hood lock, hood striker.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.05 (Optional) REMOVE A COMPLETE FRONT END ASSEMBLY

PERFORMANCE OBJECTIVE:

Given a vehicle requiring removal and replacement of the front end assembly, replacement parts if required, and the necessary tools, equipment, and materials; remove, repair, and replace the front end parts according to the manufacturer's specifications and the instructor's standards.

(NOTE: Front end disassembly/assembly should be mastered by every student intending to enter auto body repair. Front end assembly is an everyday occurence in the auto body trade and the student must know the correct procedures.)

PERFORMANCE ACTIONS:

9.0501 Remove and repair complete front end assembly.

PERFORMANCE STANDARDS:

- Remove a complete front end assembly and make necessary repairs and replace front end parts according to the manufacturer's specifications and instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

EXPANSION OF TASK:

- If the front end assembly is a partial or complete separate frame and not a unibody, the task should be expanded to demonstrate the important role that the radiator support plays and several tasks may be combined in one job. (See following task.)

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.06 REMOVE AND REPLACE BOLT-IN RADIATOR SUPPORTS

PERFORMANCE OBJECTIVE:

Given a vehicle which requires the removal and replacement of bolt-in radiator supports, replacement supports and hardware, and the necessary tools, equipment, and materials; remove and replace the support according to the manufacturer's specifications and instructor's standards.

(NOTE: See comment in "Expansion of Task" of previous task.)

PERFORMANCE ACTIONS:

9.0601	Remove radiator support.
9.0602	Replace radiator support.

PERFORMANCE STANDARDS:

- Remove and replace bolt-in radiator supports according to the manufacturer's specifications and instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Discuss use of shims.
- Discuss gussets.
- Discuss cushion assembly.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.07 REMOVE AND REPLACE HEADLAMP ASSEMBLY

PERFORMANCE OBJECTIVE:

Given a headlamp assembly mounted in a vehicle or front end assembly, replacement parts as required, tools, equipment, and materials; remove and replace the headlamp assembly so that the replaced assembly operates correctly and is aligned according to the manufacturer's specifications. The headlamps must be aligned to proper state inspection specifications.

(NOTE: This task may be for electrically or vacuum operated headlamp assemblies as well as for fixed assemblies.)

PERFORMANCE ACTIONS:

9.0701 Following manufacturer's manual, remove and replace headlamp assembly.

9.0702 Following manufacturer's specifications, align assembly.

9.0703 According to state inspection specifications, align headlamps.

PERFORMANCE STANDARDS:

- Remove and replace given headlamp assembly so that it is properly aligned to manufacturer's specifications and so headlamps are aligned to state inspection specifications.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Select tools necessary for the task.

EXPANSION OF TASK:

- Remove and replace a parking and tail lamp assembly so it operates correctly and is aligned to surrounding body parts according to the manufacturer's shop manual/specifications.

MODULE 9.0 DISASSEMBLE AND ASSEMBLE PANELS, ETC.

TASK 9.08 (Optional) REMOVE AND REPLACE FUEL TANK

PERFORMANCE OBJECTIVE:

Given a vehicle requiring replacement of fuel tank, remove and replace fuel tank. If tank is leaking, under supervision of instructor, clean hole and solder, brass patch, and reinstall tank.

PERFORMANCE ACTIONS:

9.0801	Remove fuel tank according to manufacturer's manual.
9.0802	If tank is to be repaired, drain tank, clean hole, take provisions to prevent gas fumes from igniting, solder hole.
9.0803	Replace tank according to manufacturer's manual.

PERFORMANCE STANDARDS:

- Remove and replace fuel tank.
- Leaking tank is to be repaired under instructor's supervision.
- Care must be demonstrated in removal, repair, and installation to prevent gas liquid of fume ignition.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Discuss removal and replacement of fuel tank.
- Explain how to solder fuel tank.
- List safety considerations in removal of fuel tank.
- List safety considerations in repair of fuel tank.
- Describe the safe storage of gasoline.
- Describe how to remove and replace fuel in tank.
- Discuss brass patch stock.

Module 9.0

STUDENT: ______________________________ DATE: __________

1. The front end sheet metal is called the ____.

____ a. chassis sheet metal
b. the front clip
c. the front section
d. the front skin

2. To align the front sheet metal, you start with ____.

____ a. front apron
b. the side rail
c. the radiator support
d. coul

3. There are 2 types of bumpers used on today's cars. These are impact absorbing and ____.

____ a. modular
b. fixed
c. chrome
d. reinforced

4. Most bumper energy absorber units use a ____.

____ a. form of hydraulic absortion
b. mechanical shock absorber
c. rebound energy absorber
d. rubber cushion

5. The grilles in most of today's cars are made of hard rubber or ____.

____ a. aluminum
b. chrome
c. plastic
d. alloy

6. The grille is designed to let air flow through to ____.

____ a. the carburetor
b. cool the radiator
c. to cool the air conditioner
d. to cool the engine

7. The grille usually mounts to the ____.

____ a. front fender inner skirt
b. the radiator support
c. fan shroud
d. front cross member

8. The front fender inner liner is usually made of ____.

____ a. plastic
b. rubber
c. metal
d. fiberglass

9. The main function of the front fender inner liner is to ____.

____ a. prevent mud splash
b. muffle road noise
c. prevent rust damage
d. prevent stone damage to fenders

10. The wheel house assy is located in the ____.

____ a. rear quarter panels
b. lower control arm
c. engine compartment
d. the passenger compartment

11. The front fender inner apron supports the ____.

____ a. torsion bar
b. the lower control arm
c. the McPherson strutt
d. the shock absorber

12. Four methods of panel adjustment are shims, slotted holes, caged anchor plates, and ____.

____ a. welding
b. adjustable stops
c. brazing
d. cotter pins

13. An automobile door is made up of an outer panel and ____.

____ a. regulator
b. glass
c. inner door panel
d. door frame

14. The outer door panel usually is called the ____.

____ a. outer skin
b. door cover
c. door jam
d. side panel

15. The hood is the panel that covers the ____.

____ a. radiator compartment
b. the engine compartment
c. the firewall
d. the combustion chamber

16. To align the hood panel, you first align the hood to the ____.

____ a. cowl panel
b. radiator support
c. gravel panel
d. rocker panel

17. The hood lock and safety catch are designed to ____.

____ a. do the same job
b. do two different things
c. align the hood
d. keep the hood from rattling

18. The hood hinges are designed to hold up the hood ____.

____ a. by the use of springs
b. friction
c. leverage
d. tortion

19. The hood usually is mounted by hinges to the ____.

____ a. radiator support
b. rocker panel
c. cowl panel
d. gravel panel

20. The cowl panel separates the engine compartment from the ____.

____ a. passenger compartment
b. glove compartment
c. luggage compartment
d. instrument panel

21. A trunk lid cannot be paneled because ____.

____ a. the job would be too difficult
b. an outer panel is not sold
c. it would cost too much
d. none of the above

22. The rear body panel usually contains the ____.

____ a. tail lamps
b. trunk lock
c. tag bracket
d. tag light

23. What adjustments are provided so car doors can be moved?

____ a. fore and aft
b. in and out
c. all of the above
d. up and down

24. The cowl panel is used to align ____.

____ a. the hood
b. the doors
c. the fenders
d. all of the above

25. The roof panel assembly includes the ____.

____ a. upper deck panel
b. the drip rails
c. the upper cowl panel
d. the dash panel

26. The roof panel is spot welded to ____.

____ a. the windshield header panel
b. the rear glass header panel
c. the side roof rails
d. all of the above

27. The following adds strength to the floor pan ____.

____ a. contours
b. thick metal
c. flanges
d. ridges and grooves

28. The chassis of an automobile is ____.

____ a. the frame
b. the running gear
c. the suspension
d. the frame, the suspension system and the running gear

29. The door is attached to the car body by ____.

____ a. striker plates
b. lock bolts
c. dove tails
d. hinges

30. The door hold open is incorporated in the ____.

____ a. striker plate
b. door hinge
c. door jam
d. hinge pillar

31. There are 2 types of door hinges, bolt-on and ____.

____ a. riveted
b. glued on
c. weld-on
d. strap type

32. The hinge pillar is on the side of the door where the ____.

____ a. lock is located
b. striker plate is located
c. hinge is located
d. regulator is located

33. The lock pillar is where the ____.

____ a. striker plate is located
b. door hold open is located
c. hinge is located
d. regulator is located

34. The striker plate is ____.

____ a. welded to the lock pillar
b. bolted to the lock pillar
c. is not adjustable
d. cannot be replaced

35. The lock pillar and hinge pillar must be considered when attempting to ____.

____ a. close the door
b. weatherproofing a door
c. stopping a wind noise
d. aligning a door

36. The rocker panel is located in the auto body of the ____.

____ a. upper cowl panel
b. beneath the dash
c. under the doors
d. lower grille panel

37. The rocker panel usually consists of an inner and ____.

____ a. center panel
b. reinforcement panel
c. support panel
d. outer panel

38. When a rocker panel is damaged, it is a ____.

____ a. very difficult repair job
b. very easy repair
c. simple repair
d. complex repair

39. The rocker panel is usually installed with ____.

____ a. sheet metal screws
b. acetylene welded
c. spot welded
d. rivets

40. When replacing a damaged rocker panel, you would ____.

____ a. always replace the whole panel-both inner and outer
b. replace only the outer panel
c. replace only as much panel as needed
d. always cut the panel at seams only

41. The roof panel is the ____.

____ a. strongest panel is the automobile body
b. panel with the highest contour
c. panel with the lowest contour
d. largest single panel in the automobile

42. The roof panel uses both high ____.

____ a. and low contours
b. flanges
c. beads
d. ridges

43. Contours add ____.

____ a. strength to a roof panel
b. good looks to a roof panel
c. greater visibility to a roof panel
d. to sound reduction

44. Which is not a part of a car door component?

____ a. lower sash louver guide
b. lock solenoid
c. upper body hinge
d. front up travel stop

45. A wheel house panel is located ____.

____ a. under the rear quarter panel
b. at the rocker panel
c. under the hood
d. in the trunk

46. The wheel house panel is ___.

____ a. in 3 sections
b. in 1 section
c. part of the quarter panel
d. in 2 sections, inner and outer

MODULE 10.0

GLASS REPLACEMENT

STANDARDS

- The removal and replacement of rear or front glass can be an expensive learning project unless extreme care is exercised. Glass removal and replacement should be a closely supervised learning procedure and it is recommended that the student's first attempt should be as a helper.

- After installation, visually inspect for proper seal and glass alignment.

- Water test installed glass to identify possible leaks.

- Door glass that is replaced should be properly aligned so that there are no water leaks and no wind noises. The surrounding area will have no damage to finish.

- Window glass that involves a regulator should work freely and be aligned according to manufacturer's specifications.

AUTO BODY
GLASS REPLACEMENT
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 10.0	GLASS REPLACEMENT	
10.01	Remove and Replace Stationary Glass	6
10.02	Remove and Install a Windshield-Mounted Rearview Mirror	1
10.03	Remove and Replace Regulator-Controlled Movable Glass	3
10.04	Locate and Seal Leaks Around Windshield or Rear Window	3
10.05	Replace Power Window Motor	3
	TOTAL	16

TASK LISTINGS
AUTO BODY

MODULE/UNIT	DESCRIPTION
Module 10.0	GLASS REPLACEMENT
10.01	(Remove and Replace Stationary Glass) Given vehicles with sealed and rubber channel mounted stationary glass; replacement glass, grooved rubber channels or caulking and adhesive or sealant, the necessary tools, equipment, and materials, service manual, and proper instruction or supervision; remove and replace the stationary glass. The replacement glass must be the specified type and shade and must be centered horizontally and vertically. The glass must not leak after installation. The completed job must be finished to the satisfaction of the instructor.
10.02	(Remove and Install a Windshield-Mounted Rearview Mirror) Given a vehicle, service manual, windshield-mounted rearview mirror, bonding agent, chemical solvent(s), replacement windshield-mounted rearview mirror (or removed mirror), and the necessary tools, equipment, and materials; install a windshield-mounted rearview mirror. The mounting plate must be free of distortions, nicks, and burrs. The windshield must be free of foreign matter, and the mirror must be mounted securely. The mounting plate and windshield must be free of excess glue.
10.03	(Remove and Replace Regulator-Controlled Movable Glass) Given a vehicle with regulator-controlled movable glass, service manual, replacement glass and the necessary tools, equipment, and materials; remove and replace the regulator-controlled movable glass. The window must be mounted securely in the regulator channel. The channel or roller adjustment must allow the window to raise and lower smoothly. There must be no water leaks or damage to the door hardware and weatherstripping. The door trim panel must be attached securely to the door with the specified type, color, and number of fasteners.
10.04	(Locate and Seal Leaks Around Windshield or Rear Window) On a vehicle with a leaking seal around the windshield or rear window, using given sealant, tools, equipment, and materials; locate and seal the leak(s). There must be no leaks or damage to the seals.

10.05 (Replace Power Window Motor) Given a vehicle with defective power window motor, (power lock solenoid may be included); replacement motor if required, and all necessary tools, equipment, fasteners, and materials; remove and replace the power window motor (and power lock solenoid if required) to meet manufacturer's specifications.

MODULE 10.0 GLASS REPLACEMENT

TASK 10.01 REMOVE AND REPLACE STATIONARY GLASS

PERFORMANCE OBJECTIVE:

Given vehicles with sealed and rubber channel mounted stationary glass; replacement glass, grooved rubber channels or caulking and adhesive or sealant; the necessary tools, equipment, and materials, service manual, and proper instruction or supervision; remove and replace the stationary glass. The replacement glass must be the specified type and shade and must be centered horizontally and vertically. The glass must not leak after installation. The completed job must be finished to the satisfaction of the instructor.

PERFORMANCE ACTIONS:

10.0101 Place protective coverings over exterior and interior of vehicle to prevent damage.

10.0102 Inspect and determine what type of glass is being removed. Plan the removable according to recommended procedures as outlined in the vehicle (manufacturer's) service manual.

10.0103 Follow recommended removal steps:*

a. Glass in rubber sealer.
b. Glass in grooved rubber channel.

10.0104 Follow recommended installation steps:*

a. Glass in rubber sealer.
b. Glass in grooved rubber channel.

*As a standard, See: Duenk, Williams, and Brooks, Auto Body Repair, Peoria, IL: Bennett Co., pp. 204-212, 1977.

PERFORMANCE STANDARDS:

- Remove and replace stationary glass mounted in rubber channel or rubber sealant, under supervision of instructor.
- Replacement glass must be of specified type and shade and must be centered horizontally and vertically.
- Glass must not leak after installation and installation must be to the satisfaction of the customer/instructor.
- No damage must be caused to the vehicle exterior or interior.

TASK 10.01 REMOVE AND REPLACE STATIONARY GLASS (Con't.)

SUGGESTED INSTRUCTION TIME: 6 Hours*

RELATED TECHNICAL INFORMATION:

1. SEALED TYPE GLASS:
   - Identify/demonstrate use of:
     (a) hot and cold knives
     (b) cutting wire
     (c) reveal molding clip tool
   - Identify types and shades of glass.
   - Identify sealants used with stationary glass.
   - Explain precautions to avoid cracking or breaking a windshield during removal.
   - Explain use of spacing blocks.
   - Describe stationary glass replacement procedures.
2. GASKET TYPE GLASS:
   - Identify/demonstrate use of:
     (a) lock tools
     (b) plastic paddles
     (c) pull cords
   - Identify gaskets and locks.
   - Describe stationary glass and gasket removal and replacement procedures.
3. - Describe procedures for locating and repairing leaks.
   - Safety.
   - Repairing rust damage.

*Front glass under supervision only. Typically windshield is not replaced in secondary auto body training.

MODULE 10.0 GLASS REPLACEMENT

TASK 10.02 REMOVE AND INSTALL A WINDSHIELD-MOUNTED REARVIEW MIRROR

PERFORMANCE OBJECTIVE:

Given a vehicle, service manual, windshield-mounted rearview mirror, bonding agent, chemical solvent(s), replacement windshield-mounted rearview mirror (or removed mirror), and the necessary tools, equipment, and materials; install a windshield-mounted rearview mirror. The mounting plate must be free of distortions, nicks, and burrs. The windshield must be free of foreign matter, and the mirror must be mounted securely. The mounting plate and windshield must be free of excess glue.

PERFORMANCE ACTIONS:

10.0201 Review manufacturer's service manual for removal and replacement (or installation).

10.0202 Assemble materials, tools, and, as applicable, replacement mirror.

10.0203 Follow recommended procedures for removal and replacement of windshield-rearview mirror.

REMOVAL (Optional: Most new glass will include a mount.)

10.0204 Remove rearview mirror from support.

10.0205 Place a water-dampened cloth (asbestos) around inside support to protect glass.

10.0206 From inside, heat glass with hot air gun (+/- 300 degrees F) to loosen bonding agent.

10.0207 With pliers, apply sideways pressure until mirror support loosens from windshield.

(NOTE: Steps 6 and 7 may damage the windshield if not correctly done.)

10.0208 With support removed, scrape traces of adhesive from glass, taking care not to damage glass.

INSTALLATION:

10.0209 Assemble materials and mirror, and support.

TASK 10.02 REMOVE AND INSTALL A WINDSHIELD-MOUNTED REARVIEW MIRROR

PERFORMANCE ACTIONS (Con't.):

10.0210 Locate mirror support position, mark location on outside of glass with soap, crayon, etc.

10.0211 Clean inside area with domestic scouring cleanser of glass cleaning solution. Dry glass. Clean area with an alcohol-saturated paper towel to remove cleaning compound or solution.

10.0212 Sand bonding surface or mirror support with emery cloth (# 320, etc.).

(NOTE: If old support is being installed, remove all bonding residue.)

10.0213 Clean support with alcohol saturated cloth.

10.0214 On clean and dry support, apply several drops of adhesive and spread adhesive quickly over mounting surface.

10.0215 Position support in premarked location, pressing evenly against windshield for about one-half to one minute. Allow adhesive about five minutes to dry. Remove excess with a cloth and alcohol.

PERFORMANCE STANDARDS:

- Remove and install a windshield-mounted rearview mirror so no damage results to the windshield.
- The mounting plate must be free of distortions, nicks, and burrs, and the windshield must be free of foreign matter, and the mirror must be mounted securely.
- The mounting plate and windshield must be free of excess glue.
- Location and operation of the mirror must be to manufacturer's specifications.

SUGGESTED INSTRUCTION TIME: 1 Hour

RELATED TECHNICAL INFORMATION:

- Identify procedures for removing a windshield-mounted rearview mirror.
- Identify:
  - a. cleaning materials
  - b. sanding materials
  - c. bonding agents used to install the mirror
- Describe/demonstrate the procedure for installing a windshield-mounted rearview mirror.
- Safety.

MODULE 10.0 GLASS REPLACEMENT

TASK 10.03 REMOVE AND REPLACE REGULATOR-CONTROLLED MOVABLE GLASS

PERFORMANCE OBJECTIVE:

Given a vehicle with regulator-controlled movable glass, service manual, replacement glass, and the necessary tools, equipment, and materials; remove and replace the regulator-controlled movable glass. The window must be mounted securely in the regulator channel. The channel or roller adjustment must allow the window to raise and lower smoothly. There must be no water leaks or damage to the door hardware and weatherstripping. The door trim panel must be attached securely to the door with the specified type, color, and number of fasteners.

PERFORMANCE ACTIONS:

10.0301 Review service manual on removal and replacement or regulator-controlled movable glass in doors.

10.0302 Select tools and materials.

10.0303 Remove inside door hardware and trim.

10.0304 Follow manufacturer's recommendations for removal and replacement of regulator-controlled movable glass.

10.0305 Locate adjustment points.

10.0306 Align window to prevent:

a. wind noise
b. water leaks
c. rattle

10.0307 Test for window seal and for proper window movement up and down.

PERFORMANCE STANDARDS:

- Remove and replace regulator-controlled movable glass (in door).
- The window must be mounted securely in the regulator channel.
- The channel or roller adjustment must allow the window to raise and lower smoothly.
- There must be no water leaks or damage to door hardware or weatherstripping.

PERFORMANCE STANDARDS (Con't.):

- The door trim panel must be attached securely to the door with the specified type, color, and number of fasteners.
- As required, the window must be aligned for proper operation with no wind noise, water leaks, or rattle.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Identify, select, and demonstrate use of fasteners removal/installation tools.
- Explain fastening methods and identify types of fasteners typically used to secure glass to regulator.
- Describe channel and roller removal and replacement procedures.
- Describe removal and replacement procedures for regulator-controlled movable glass.
- Safety.

EXPANSION OF TASK:

1. REPLACE MOVABLE (VENT) GLASS

PERFORMANCE OBJECTIVE:

On a vehicle equipped with pivot glass, given replacement glass and assembly, and necessary tools, equipment, materials, and service manual; remove and replace the pivot glass and pivot assembly. The pivot glass assembly must open, close, and latch as specified with no air or water leaks. There must be no damage to the door hardware or weatherstripping.

PERFORMANCE ACTIONS:

Follow manufacturer's recommended procedures for removal and replacement of pivot glass.

PERFORMANCE STANDARDS:

- Stated in above objective.

SUGGESTED INSTRUCTION TIME: Optional

EXPANSION OF TASK (Con't.):

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of pivot assembly removal tools.
- Explain methods by which pivot glass can operate.
- Explain method of securing glass to pivot assembly.
- Describe procedure for replacing pivot glass and pivot assembly procedures.
- Safety.

2. REPLACE SLIDING GLASS

PERFORMANCE OBJECTIVE:

Given a vehicle with sliding glass, replacement glass, and the necessary tools, equipment, and materials; remove and replace the sliding glass (or, for example, remove rear window of pickup truck and replace with sliding glass). The replaced glass must slide freely and mate with latches. There must be no air or water leaks or damage to the track assembly and weatherstripping.

PERFORMANCE ACTIONS:

Manufacturer's recommended procedures.

PERFORMANCE STANDARDS:

- Stated in above objective.

SUGGESTED INSTRUCTION TIME: Optional

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of track removal tools.
- Identify types of sliding glass.
- Describe track removal and replacement procedures.
- Describe sliding glass removal and replacement procedures.
- Safety.

MODULE 10.0 GLASS REPLACEMENT

TASK 10.04 LOCATE AND SEAL LEAKS AROUND WINDSHIELD OR REAR WINDOW

PERFORMANCE OBJECTIVE:

On a vehicle with a leaking seal around the windshield or rear window, using given sealant, tools, equipment, and materials; locate and seal the leak(s). There must be no leaks or damage to the seals.

PERFORMANCE ACTIONS:

10.0401	Determine place of leak by testing with water.
10.0402	Select required tools and materials.
10.0403	Remove reveal molding as necessary.
10.0404	Seal as required.
10.0405	Check by water test.
10.0406	Replace molding.
10.0407	Clean and remove excess sealer.

PERFORMANCE STANDARDS:

- Locate window leak(s) seal leaks so that there is no damage to vehicle and so the finished work does not leak under water pressure.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Identify/demonstrate use of caulking guns and caulking compound.
- Explain methods used for locating leaks.
- Demonstrate reveal molding removal procedures.
- Identify sealers and explain their uses.
- Describe procedure for repairing leaks with sealer.
- Safety.

TASK 10.05 REPLACE POWER WINDOW MOTOR

PERFORMANCE OBJECTIVE:

Given a vehicle with defective power window motor, (power lock solenoid may be included); replacement motor if required, and all necessary tools, equipment, fasteners, and materials; remove and replace the power window motor (and power lock solenoid if required) to meet manufacturer's specifications.

PERFORMANCE ACTIONS:

10.0501 Inspect vehicle power window operation and determine that power motor must be removed.

10.0502 Remove and replace power window motor (and, if required, power lock solenoid) following procedures.

10.0503 Repaired power window (and power lock solenoid) must operate correctly to manufacturer's specifications.

PERFORMANCE STANDARDS:

- Replace power window motor on given vehicle (and power lock solenoid if required) so that power window or lock operates as intended.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Use of door handle removing tool and hand tools.
- Operation of power motor.
- Operation of power lock solenoid.
- Replacement procedures.
- Safety.

MODULE 10.0

STUDENT: ______________________________ DATE: ___________

1. Which of the following is a characteristic of tempered glass?

____ a. three layers
b. breaks into large pieces
c. has plastic inner layers
d. breaks into tiny granular particles

2. Select the poorest use for tempered glass.

____ a. windshield
b. quarter glass
c. front door glass
d. rear window glass

3. The panel that supports the windshield glass is ____.

____ a. the dash panel
b. the cowl panel
c. the rocker panel
d. the firewall

4. The windshield is attached to the body by the use of ____.

____ a. rubber channels
b. chrome molding
c. butyl rubber sealer
d. weatherstrip cement

5. A fixed glass can also include ____.

____ a. rear side glass
b. front door glass
c. rear door glass
d. front vent glass

6. Door glass hardware includes all the parts needed to ____.

____ a. keep rain out of car
b. hold or move the glass
c. keep rattles out of glass
d. stop wind noises

7. When removing a fixed glass, it has to be cut out using ____.

____ a. piano wire
b. hot knife
c. cold knife
d. all of the above

8. The door glass regulator ____.

____ a. controls the length of travel of the glass
b. keeps the glass in the channels
c. moves the glass up and down
d. controls the speed of the glass travel

9. There are 2 types of glass regulators, manual and ____.

____ a. speed
b. power
c. slow
d. automatic

10. The lift channel is not a part of the _____.

____ a. door lock assembly
b. vent assembly
c. regulator assembly
d. all of the above

11. Which of the following is not a part found in movable glass regulator assemblies?

____ a. up-stop
b. rubber channel
c. pivot guide
d. lift channel or track

12. The largest piece of glass hardware is the ____.

____ a. lower sash cam
b. regulator assembly
c. front window guide
d. inner panel cam

13. When installing a new windshield using rubber sealer, the body worker should _____.

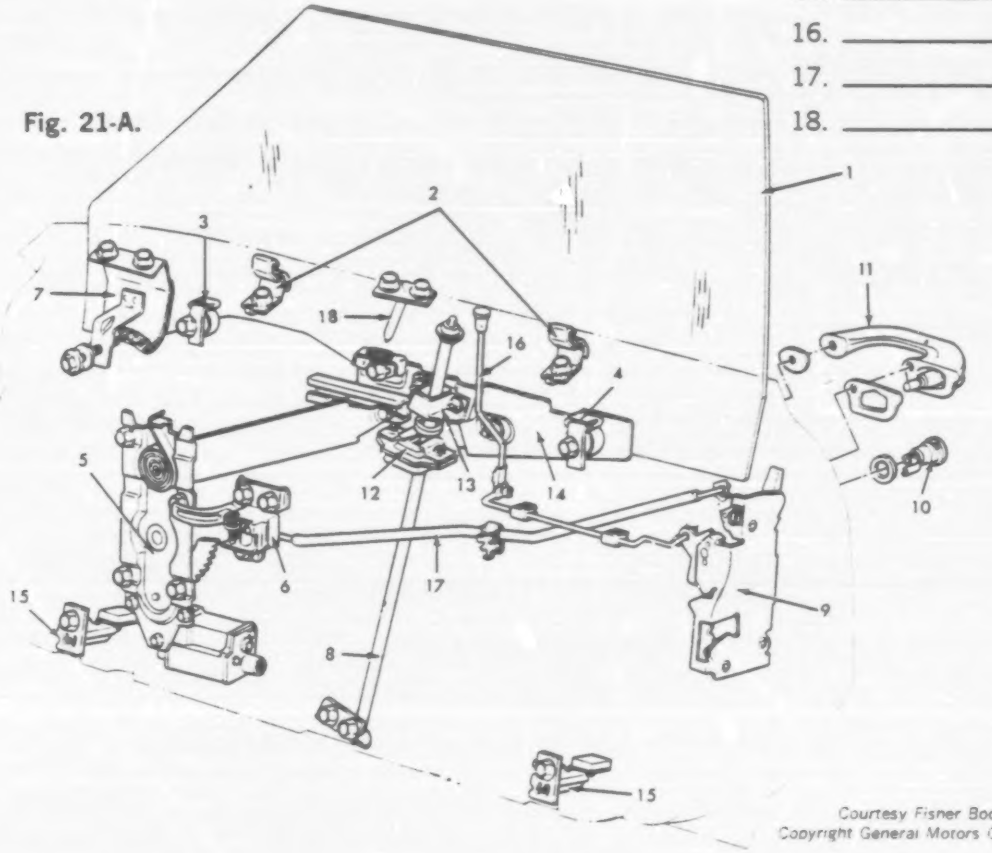
_____ a. press the sealer against the windshield opening and then slide the glass around until it is properly aligned.
b. lubricate the sealer with soapy water
c. use a heavy cord to pull the sealer over the flange
d. use maskin tape "alignment marks"

14. Identify the door hardware of a typical hardtop body style vehicle (without ventilator window) shown below by placing the identifying letters from the left-hand column in the appropriate spaces at the right.

A. Guide assembly, lower sash lower
B. Glass bearing plate
C. Front door window assembly
D. Belt trim support retainers
E. Guide pin stabilizer (on belt reinforcement)
F. Rod, remote control to lock
G. Support window bumper
H. Rod, inside locking
I. Door lock remote control and handle assembly
J. Stop, window front upper
K. Plate assembly, lower sash guide
L. Door outside handle
M. Guide assembly, lower sash upper
N. Tube assembly, window guide
O. Door lock
P. Window regulator, electric
Q. Stop, window rear upper
R. Door lock cylinder

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
13. ____________________
14. ____________________
15. ____________________
16. ____________________
17. ____________________
18. ____________________

Fig. 21-A.



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MODULE 11.0

BASIC BODY AND FRAME ALIGNMENT

Body and frame alignment tasks are limited at the secondary level by the lack of frame equipment and training time.

STANDARDS

- Although a framework task may appear to be simple, it should not be taken lightly by students. Work should follow recommended procedures and all safety rules must be observed.
- No steps or pulls should be performed without the instructor's observation.
- Two or more students generally may be assigned to frame tasks.
- All manufacturer's specifications must be achieved preferably exact but can be +/- 1/8 inch unless otherwise specified.

AUTO BODY
BASIC BODY AND FRAME ALIGNMENT
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 11.0	BASIC BODY AND FRAME ALIGNMENT	
11.01	(ORIENTATION) Determine Conventional Body Shell and Frame Alignment	*
11.02	(ORIENTATION) Align Conventional Body Shell and Frame	*
11.03	(ORIENTATION) Repair Frame Horns and Cross Members	*
11.04	(OPTIONAL) Overhaul Conventional Suspension	*
11.05	(ORIENTATION) Determine Type of Frame Damage and Required Repairs	3
		15

*Orietation because of equipment available.

Frame training is considered by Task Force Committee as specialized training.

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 11.0	BASIC BODY AND FRAME ALIGNMENT
11.01	(Determine Conventional Body Shell and Frame Alignment) Provided a vehicle requiring body and frame inspection, frame and centering gauges, and the required tools, equipment, and materials and given necessary instruction and specifications; determine body shell and frame alignment. Measured factory reference point must be to manufacturer's tolerances. Findings must agree with instructor's findings.
11.02	(Align Conventional Body Shell and Frame) Given a vehicle with a conventional frame requiring alignment, frame alignment equipment, frame gauge, and the necessary tools, equipment, and materials; align the body shell and frame to manufacturer's specifications at factory reference points.
11.03	(Repair Frame Horns and Cross Members) Provided a vehicle with damaged frame horns and cross members, and the necessary tools, equipment, and materials; repair the frame horns and cross members. The frame horns and cross members must be in alignment with manufacturer's specifications and no additional damage will be caused.
11.04	(Overhaul Conventional Suspension) Provided with a vehicle with a conventional suspension, service manual, and the required tools, equipment, and materials; overhaul the suspension system. The upper and lower control arms, shock absorbers, tie rods, spindle, spring assembly, and backing plate must be repaired or replaced. All components must be aligned and mounted securely, free of foreign matter, and well lubricated. The suspension system must operate in accordance with manufacturer's specifications.
11.05	(Determine Type of Frame Damage and Required Repairs) Inspect a given vehicle with frame damage and determine the type of damage and how to best correct it. Determine if the vehicle is a body and frame type or a unitized body type. Check frame alignment as required.

TASK 11.01 (Orientation) DETERMINE CONVENTIONAL BODY SHELL AND FRAME ALIGNMENT

PERFORMANCE OBJECTIVE:

Provided a vehicle requiring body and frame inspection, frame and centering gauges, and the required tools, equipment, and materials and given necessary instruction and specifications; determine body shell and frame alignment. Measured factory reference point must be to manufacturer's tolerances. Findings must agree with instructor's findings.

PERFORMANCE ACTIONS: (Actions determined by instructor.)

PERFORMANCE STANDARDS:

- Determine conventional body shell and frame alignment on a given vehicle.
- Measurements at factory reference points must be to tolerances.
- Findings must agree with those of the instructor.

SUGGESTED INSTRUCTION TIME: *

RELATED TECHNICAL INFORMATION:

- Demonstrate necessary mathematical skills to complete task (i.e., multiplication and division of fractions).
- Identify and demonstrate use of frame centering gauges.
- Define datum line and centering line.
- Explain why a vehicle must be on four supports of equal height when using a centering gauge.
- Identify and describe types of conventional body shells and frames.
- Describe procedure for determine body and frame alignment.
- Identify safety considerations.

*Orientation because of equipment available.

TASK 11.02 (Orientation) ALIGN CONVENTIONAL BODY SHELL AND FRAME

PERFORMANCE OBJECTIVE:

Given a vehicle with a conventional frame requiring alignment, frame alignment equipment, frame gauge, and the necessary tools, equipment, and materials; align the body shell and frame to manufacturer's specifications at factory reference points.

PERFORMANCE ACTIONS: (Actions determined by instructor.)

PERFORMANCE STANDARDS:

- Align conventional body shell and frame to manufacturer's specifications at factory reference points.

SUGGESTED INSTRUCTION TIME: *

RELATED TECHNICAL INFORMATION:

- Demonstrate necessary dimensional measurement skills to accomplish task.
- Identify/demonstrate use of stationary or portable frame alignment equipment.
- Describe use of frame gauge in determining body shell and frame alignment.
- Describe/demonstrate procedure for aligning conventional body shell and frames with stationary or portable equipment.
- Identify safety considerations.

*Orientation because of equipment available.

MODULE 11.0 BASIC BODY AND FRAME ALIGNMENT

TASK 11.03 (Orientation) REPAIR FRAME HORNS AND CROSS MEMBERS

PERFORMANCE OBJECTIVE:

Provided a vehicle with damaged frame horns and cross members, and the necessary tools, equipment, and materials; repair the frame horns and cross members. The frame horns and cross members must be in alignment with manufacturer's specifications and no additional damage will be caused.

PERFORMANCE ACTIONS: (Actions determined by instructor.)

PERFORMANCE STANDARDS:

- Repair frame horns and cross members of a given vehicle so that they are in alignment with the manufacturer's specifications and no additional damage is caused.

SUGGESTED INSTRUCTION TIME: *

RELATED TECHNICAL INFORMATION:

- Demonstrate required skill in measuring.
- Explain design and function of frame horns and cross members.
- Explain methods used to determine damage to frame horns and cross members.
- Describe/demonstrate procedure for repairing frame horns and cross members.
- Identify safety considerations.

*Orientation because of equipment available.

TASK 11.04 (Optional*) OVERHAUL CONVENTIONAL SUSPENSION

PERFORMANCE OBJECTIVE:

Provided with a vehicle with a conventional suspension, service manual, and the required tools, equipment, and materials; overhaul the suspension system. The upper and lower control arms, shock absorbers, tie rods, spindle, spring assembly, and backing plate must be repaired or replaced. All components must be aligned and mounted securely, free of foreign matter, and well lubricated. The suspension system must operate in accordance with manufacturer's specifications.

PERFORMANCE ACTIONS: (Actions determined by instructor.)

PERFORMANCE STANDARDS:

- Overhaul conventional suspension requiring repair, repairing and replacing upper and lower control arms, shock absorbers, tie rods, spindle, spring assembly, and backing plate, as appropriate.
- All components must be aligned and mounted securely, free of foreign matter, and well lubricated.
- The finished suspension system must operate in accordance with manufacturer's specifications.

SUGGESTED INSTRUCTION TIME: * Orientation

RELATED TECHNICAL INFORMATION:

- Explain functions and operation of a conventional suspension system.
- Explain function and operation of:
    - upper and lower control arms
    - shock absorbers
    - tie rods
    - spindle
    - spring assembly
    - locking plate
- Describe procedure for removing and replacing:
    - upper and lower control arms
    - shock absorbers
    - tie rods
    - spindle
    - spring assembly
    - backing plate
- Describe how to lubricate a conventional suspension system.
- Safety.

*If situation and competent student allows

TASK 11.05 (Orientation) DETERMINE TYPE OF FRAME DAMAGE AND REQUIRED REPAIRS

PERFORMANCE OBJECTIVE:

Inspect a given vehicle with frame damage and determine the type of damage and how to best correct it. Determine if the vehicle is a body and frame type or a unitized body type. Check frame alignment as required.

PERFORMANCE ACTIONS: (Practical exercise)

11.0501 Inspect vehicle.

11.0502 Determine damage.

11.0503 Estimate required repairs.

PERFORMANCE STANDARDS:

- Inspect a given vehicle, determine type of frame damage, and estimate required repairs to return vehicle to manufacturer's specifications and so it will be safe to drive.

SUGGESTED INSTRUCTION TIME: *

RELATED TECHNICAL INFORMATION:

- Check alignment: frame and body, unitized body.
- Describe how to use/demonstrate skill in using:
    - centering gauges
    - frame gauges
    - tape measure
- Orientation to frame machine, frame gauges.

*Orientation because of equipment available.

STUDENT: ______________________________ DATE: ______________

1. A datum line is ____.

____ a. an imaginary line under the frame
b. a line used to check toe out
c. a torsion line
d. a flexible line

2. One type of frame damage is the ____.

____ a. ladder
b. triangle
c. perimeter
d. diamond

3. When a frame is in correct alignment ____.

____ a. the tram gauge will line up
b. the datum line will be straight
c. all the frame centering gauges will line up
d. you will be able to line up the front wheel

4. There are 2 basic types of frames used in auto construction, conventional frames, and ____.

____ a. ladder
b. unitized
c. perimeter
d. modular

5. The area of a frame that is designed to absorb a front or rear collision impact is ____.

____ a. the torque box
b. front cross member
c. side rail
d. the stub frame

MODULE 12.0

ELECTRICAL SYSTEM REPAIRS/REPLACEMENTS

The following tasks concerning the automotive electrical system are included as typical tasks that the auto body mechanic might be required to accomplish in a local dealership. Electrical system repair/replacement tasks that have been omitted probably would be accomplished by an automotive mechanic or another specialist.

Secondary instruction times and materials encourage the training tasks (objectives) to be restricted to jobs typically required of the auto body mechanic.

AUTO BODY
ELECTRICAL SYSTEM REPAIRS/REPLACEMENTS
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 12.0	ELECTRICAL SYSTEM REPAIRS/REPLACEMENTS	
12.01	Remove and Replace a Battery	1
12.02	Remove and Replace a Fuse	1/2
12.03	Perform an Operational Test of External Lighting Circuits	1 1/2
12.04	Remove and Replace a Bulb	1/2
12.05	Remove and Replace Headlights	2
12.06	Remove and Replace a Socket	2 1/2
12.07	Remove and Replace a Horn Relay	1
12.08	Remove and Replace Antenna Assembly	3
12.09	Replace a Power Solenoid	3
	TOTAL	15

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 12.0	ELECTRICAL SYSTEM REPAIRS/REPLACEMENTS
12.01	(Remove and Replace a Battery) Provided with a vehicle, service manual, replacement battery, terminal puller, and the necessary tools and materials; remove and replace the battery. The battery must be mounted securely by fasteners in the battery retainer. The battery cables must be attached positive to positive and negative to negative, and the connections must be mechanically and electrically secure.
12.02	(Remove and Replace a Fuse) Given a vehicle with a shorted electrical circuit that requires removal and replacement of a fuse, a replacement fuse, fuse puller, and other materials or tools that may be required; remove and replace a fuse. The replacement fuse must be the specified size, type, and capacity and be mounted mechanically and electrically secure in the fuse holder.
12.03	(Perform an Operational Test of External Lighting Circuits) Given a vehicle and service manual; check the operation of all exterior lights and control switches and determine if they are operating in accordance with the manufacturer's standards.
12.04	(Remove and Replace a Bulb) Given a vehicle, service manual, replacement bulb, and the required tools, equipment and materials; remove and replace a faulty bulb. The bulb must fit securely in the socket and operate according to the manufacturer's specifications.
12.05	(Remove and Replace Headlights) Given a vehicle, service manual, replacement headlights, and the required tools, equipment, and materials; remove and replace headlights. The headlights must be mounted securely with the specified type and number of fasteners, and the plug connections must be mechanically and electrically secure. The headlights must operate in the off, low beam, and high beam modes.
12.06	(Remove and Replace a Socket) Given a vehicle, service manual, wiring diagram, replacement socket, and the necessary tools, equipment, and materials; remove and replace a socket. The socket must be mounted securely, and the connections must be mechanically and electrically secure. The wiring must be in accordance with the wiring diagram and free of electrical hazards.

12.07 (Remove and Replace a Horn Relay) Given a vehicle, service manual, wiring diagram, replacement horn relay, and the required tools, equipment, and materials; remove and replace a horn relay. The relay must be mounted securely, and the connections must be mechanically and electrically secure. The wiring must be in accordance with the wiring diagram and be free of electrical hazards. The relay must operate according to the manufacturer's specifications.

12.08 (Remove and Replace Antenna Assembly) Given a vehicle equipped with an antenna or a power antenna assembly, service manual, replacement antenna assembly, and the necessary tools, equipment, and materials; remove and replace the antenna assembly. The antenna must be mounted securely and connections must be mechanically and electrically secure. As applicable, control wiring must be according to wiring diagrams and must be free of electrical hazards; the motor must operate under load, and the antenna must operate satisfactorily in both directions. Proper radio reception must be obtained when the antenna is connected to the radio.

12.09 (Replace a Power Solenoid) Given a power window motor or power lock solenoid, electrically operated, replacement soldenoid and other materials that may be required, and the necessary tools and equipment; replace the solenoid and accompanying damaged parts so that the installation works according to the manufacturer's specifications.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.01 REMOVE AND REPLACE A BATTERY

PERFORMANCE OBJECTIVE:

Provided with a vehicle, service manual, replacement battery if necessary, battery lift strap, terminal spreader, battery terminal puller, and the necessary tools and materials; remove and replace the battery. The battery must be mounted securely by fasteners in the battery retainer. The battery cables must be attached positive to positive and negative to negative, and the connections must be mechanically and electrically secure.

PERFORMANCE ACTIONS: (i.e., Battery removal for repairs to electrical system.)

12.0101 Determine that the battery needs to be removed.

12.0102 Without damage, disconnect the negative and the positive battery cables from battery, placing the battery cables and connectors so that they will not cause damage to the vehicle. The connectors or cables should be cleaned or repaired as necessary.

12.0103 Remove the battery retaining fasteners and holder.

12.0104 Using the battery lift device, such as a strap, remove the battery without damage to the vehicle and without spilling battery acid on clothing, etc.

12.0105 Replace the battery using proper techniques so that it is mounted securely.

12.0106 Install the battery cables to the battery so that proper polarity is observed and so that a secure mechanical and electrical connection is made.

PERFORMANCE STANDARDS:

- Remove and replace a battery using proper tools, using a proper method of lifting the battery from the vehicle and placing it into the vehicle, and clean the battery terminals and cable connections so that a good mechanical and electrical connection may be made.

SUGGESTED INSTRUCTION TIME: 1 Hour

RELATED TECHNICAL INFORMATION:

- Demonstrate use of battery lifting device (such as battery strap).
- Identify vehicle battery connector locations.
- Describe typical procedures for removing and replacing a battery.
- Identify safety considerations.

- Identify and demonstrate use of battery cable removal tools.
- Identify types of battery cables.
- Describe procedures for removing and replacing battery cables (negative and positive cables).

- Define electrolyte and explain its purpose.
- Describe procedures for adding water to battery.
- Identify signs indicating a cracked battery case.
- Describe procedures for inspecting and cleaning a battery.
- Demonstrate procedure for testing a batteries state of charge.
- Describe procedure for charging batteries.
- Identify restrictions on quick-charging batteries.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.02 REMOVE AND REPLACE A FUSE

PERFORMANCE OBJECTIVE:

Given a vehicle with a shorted electrical circuit that requires removal and replacement of a fuse, a replacement fuse, fuse puller, and other materials or tools that may be required; remove and replace a fuse. The replacement fuse must be the specified size, type, and capacity and be mounted mechanically and electrically secure in the fuse holder.

PERFORMANCE ACTIONS:

12.0201 Locate the fuse needing replacement by:

a. Inspecting the fuse block for blown fuse.
b. Check the service manual for the fuse location for the circuit trouble.

12.0202 Remove fuse following recommended procedures. (Use insulated fuse puller.)

12.0203 Identify replacement fuse.

12.0204 Replace fuse.

12.0205 Check circuit operation.

PERFORMANCE STANDARDS:

- Remove and replace a fuse using the proper replacement type for the circuit.
- The performance must be acceptable to the instructor.

SUGGESTED INSTRUCTION TIME: 1/2 Hour

RELATED TECHNICAL INFORMATION:

- Explain purpose of fuse.
- Identify specifications for fuse amperage using a service manual.
- Describe installation procedures for fuses.
- Identify typical automotive fuses by size, type, and capacity.
- Identify safety considerations.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.03 PERFORM AN OPERATIONAL TEST OF EXTERNAL LIGHTING CIRCUITS

PERFORMANCE OBJECTIVE:

Given a vehicle and service manual; check the operation of all exterior lights and control switches and determine if they are operating in accordance with the manufacturer's standards.

PERFORMANCE ACTIONS:

12.0301 Visually inspect operation of following lights: (as applicable)

a. Parking lights.
b. Headlights (high and low beams).
c. Taillights.
d. Turn signals.
e. Brakes.
f. Marker.
g. Clearance.
h. Backup.
i. License plate.

12.0302 Test operation of all exterior lighting control switches that may have been damaged by possible short circuiting, etc.

12.0303 List any lighting circuit that is not operating according to manufacturer's standards.

PERFORMANCE STANDARDS:

- Perform an operational inspection of all exterior lights and control switches on the vehicle provided by the instructor, and identify those that are malfunctioning.

SUGGESTED INSTRUCTION TIME: 1 1/2 Hours

RELATED TECHNICAL INFORMATION:

- Inspection of fuses.
- Removal and replacement of light covers.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.04 REMOVE AND REPLACE A BULB

PERFORMANCE OBJECTIVE:

Given a vehicle, service manual, replacement bulb, and the required tools, equipment and materials; remove and replace a faulty bulb. The bulb must fit securely in the socket and operate according to the manufacturer's specifications.

PERFORMANCE ACTIONS:

12.0401 Locate/identify the faulty bulb.

12.0402 Identify the type, etc., of replacement bulb.

(NOTE: This step may be delayed until the bulb is removed.)

12.0403 Remove light/bulb cover assembly.

12.0404 Remove bulb.

12.0405 Verify replacement bulb is correct type.

12.0406 Install replacement bulb.

12.0407 Check circuit/light operation.

PERFORMANCE STANDARDS:

- Remove and replace a faulty bulb so that it fits securely in the socket and operates according to the manufacturer's specifications.

SUGGESTED INSTRUCTION TIME: 1/2 Hour

RELATED TECHNICAL INFORMATION:

- Identify bulbs by type, size, and function.
- Explain operation of bulbs.
- Describe the procedure for removing and replacing bulbs.
- Identify safety considerations.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/REPLACEMENTS

TASK 12.05 REMOVE AND REPLACE HEADLIGHTS

PERFORMANCE OBJECTIVE:

Given a vehicle, service manual, replacement headlights, and the required tools, equipment, and materials; remove and replace headlights. The headlights must be mounted securely with the specified type and number of fasteners, and the plug connections must be mechanically and electrically secure. The headlights must operate in the off, low beam, and high beam modes.

PERFORMANCE ACTIONS:

12.0501 Remove headlight covers, assemblies as necessary.

12.0502 Remove headlight electrical socket.

12.0503 Remove headlight.

12.0504 Install new headlight.

12.0505 Connect electrical socket.

12.0506 Assemble covers, etc.

12.0507 Test light for low and high beam.

12.0508 If shop is equipped with headlight adjustment equipment, adjust headlights to specifications.

(ALTERNATE: Refer vehicle to auto mechanic for headlight adjustment.)

PERFORMANCE STANDARDS:

- Remove and replace headlights so that replaced light is securely mounted with proper fasteners and operates in the low and high modes.

SUGGESTED INSTRUCTION TIME: 2 Hours

RELATED TECHNICAL INFORMATION:

- Explain how headlights operate.
- Describe procedure for removing and replacing headlights.
- Identify safety considerations.

RELATED TECHNICAL INFORMATION (Con't.):

- HEADLIGHT ADJUSTMENTS: (orientation, typically)
    - Demonstrate/explain use of headlight aiming equipment.
    - Explain low and high beam angles, elevations.
    - Explain effects of sagged springs.
    - Describe procedure for headlight alignment.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.06 REMOVE AND REPLACE A SOCKET

PERFORMANCE OBJECTIVE:

Given a vehicle, service manual, wiring diagram, replacement socket, and the necessary tools, equipment, and materials; remove and replace a socket. The socket must be mounted securely, and the connections must be mechanically and electrically secure. The wiring must be in accordance with the wiring diagram and free of electrical hazards.

PERFORMANCE ACTIONS:

12.0601 Identify replacement needs.

12.0602 Assemble required tools and materials such as electrical crimpers, solderless connectors, electrical tape, etc.

12.0603 Remove faulty/damaged socket according to recommended procedures.

12.0604 Replace socket following procedures recommended by manufacturer or as appropriate for the job.

12.0605 Check to ensure that color codes are properly followed and that all polarities are correct. Check to ensure that no grounds or shorts have been caused.

12.0606 Check operation of circuit.

PERFORMANCE STANDARDS:

- Remove and replace a socket so that it is mounted securely and the connections are mechanically and electrically secure.
- The wiring must be according to the wiring diagram and free of electrical hazards.

SUGGESTED INSTRUCTION TIME: 2 1/2 Hours

RELATED TECHNICAL INFORMATION:

- Identify sockets by type, size, and function.
- Explain operation of sockets.
- Explain wiring methods for sockets.
- Describe procedure for removing and replacing a socket.
- Identify safety considerations.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.07 REMOVE AND REPLACE A HORN RELAY

PERFORMANCE OBJECTIVE:

Given a vehicle, service manual, wiring diagram, replacement horn relay, and the required tools, equipment, and materials; remove and replace a horn relay. The relay must be mounted securely, and the connections must be mechanically and electrically secure. The wiring must be in accordance with the wiring diagram and be free of electrical hazards. The relay must operate according to the manufacturer's specifications.

PERFORMANCE ACTIONS:

12.0701 Identify part to be removed and replaced.

12.0702 Obtain replacement part.

12.0703 Remove electrical wiring.

12.0704 Remove and replace horn relay.

12.0705 Connect electrical wiring properly following original wiring pattern.

12.0706 Check circuit for proper operation.

PERFORMANCE STANDARDS:

- Remove and replace a horn relay so that it is mounted securely with mechanically and electrically secure connections and so the wiring follows manufacturer's wiring diagram and is free of electrical hazards.

SUGGESTED INSTRUCTION TIME: 1 Hour

RELATED TECHNICAL INFORMATION:

- Explain operation of horn relay.
- Describe wiring methods used for horn relays.
- Describe procedure for removing and replacing horn relay.
- Identify safety considerations.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.08 REMOVE AND REPLACE ANTENNA ASSEMBLY

PERFORMANCE OBJECTIVE:

Given a vehicle equipped with an antenna or a power antenna assembly, service manual, replacement antenna assembly, and the necessary tools, equipment, and materials; remove and replace the antenna assembly. The antenna must be mounted securely and connections must be mechanically and electrically secure. As applicable, control wiring must be according to wiring diagrams and must be free of electrical hazards; the motor must operate under load, and the antenna must operate satisfactorily in both directions. Proper radio reception must be obtained when the antenna is connected to the radio.

PERFORMANCE ACTIONS:

12.0801 Remove antenna according to recommended procedures. (If antenna is power operated, student should draw a diagram of electrical control connections.)

12.0802 Install new antenna (assembly) following recommended procedures.

12.0803 Connect electrical control wires according to manufacturer's manual or drawing done at disassembly.

12.0804 If power assembly, test operation in up/ down modes.

12.0805 Connect antenna to vehicle radio and test operation.

PERFORMANCE STANDARDS:

- Remove and replace antenna assembly, manually and/or electrical motor drive type, so that the antenna is fastened properly to the vehicle and operated as intended.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- MANUAL ANTENNA:
  - Describe procedure for removing and replacing antenna.
  - Describe wiring methods for manual antenna.
- POWER ANTENNA:
  - Identify types of common power antenna assemblies.
  - Explain operation of power antenna motor.
  - Explain wiring method used for a power antenna assembly.
  - Describe procedure for removing and replacing power assembly.
  - Identify safety precautions.

MODULE 12.0 ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS

TASK 12.09 REPLACE A POWER SOLENOID

PERFORMANCE OBJECTIVE:

Given a power window motor or power lock solenoid, electrically operated, replacement solenoid and other materials that may be required, and the necessary tools and equipment; replace the solenoid and accompanying damaged parts so that the installation works according to the manufacturer's specifications.

PERFORMANCE ACTIONS:

12.0901 Following manufacturer's shop manual and specifications, remove and replace a power solenoid in a given situation (e.g., power window or power lock).

12.0902 Observe all safety precautions.

PERFORMANCE STANDARDS:

- Replace a power solenoid in a given power window or power lock application.
- Procedures must follow manufacturer's manual and manufacturer's specifications must be met.
- Safety precautions must be observed.

SUGGESTED INSTRUCTION TIME: 3 Hours

RELATED TECHNICAL INFORMATION:

- Outline safety considerations.
- Check solenoid for proper operation and to determine if required voltage is reaching solenoid when controls are operated (i.e., Determine that the problem is the solenoid and not in the wiring.)
- If repair is to power window motor, check for the proper method of holding the glass while the motor is removed.

EXPANSION OF TASK:

- Replace a remote door or trunk lock so that the unit works according to manufacturer's specifications. No damage will result to the surrounding area of the vehicle.

ELECTRICAL TASK OMITTED FROM MODULE

The following electrical system tasks which could be accomplished by the auto body mechanic have been omitted from this articulated, instruction guide because the tasks may or may not be within the responsibility of the auto body mechanic in local dealership and shops, because they represent advanced skills, or because of limited training time or materials.

- Service a battery
- Charge a battery
- Test a switch
- Remove and replace a switch
- Test a circuit breaker
- Remove and replace a circuit breaker
- Remove and replace a wiring harness
- Repair a wiring harness
- Perform an operational test of internal lighting circuits
- Adjust headlights
- Test electrical motor
- Remove and replace power window motor (This task is covered in another module.)

Module 12.0

STUDENT: ______________________________ DATE: ___________

1. The head lamp assembly includes about 18 parts, among these are ____.

____ a. dimmer switch
b. headlamp relay
c. vertical and horizontal adjusting screws
d. turn signal lamp

2. The 3 guide points on a sealed beam unit are used to ____.

____ a. mount headlamps
b. aim headlamps
c. ground headlamps
d. focus headlamps

3. The typical cause of dim headlamps is a ____.

____ a. loose ground
b. dead battery
c. low electrolyte level
d. weak battery

4. A fuse or circuit breaker is placed in the automobile electrical system to protect against ____.

____ a. dead batteries
b. burned out alternator
c. short circuits
d. damage to voltage regulator

5. The ignition system does not include the ____.

____ a. distributor
b. coil
c. condensor
d. alternator

6. The part of the electrical system typically damaged in a collision is the ____.

____ a. alternator
b. the voltage regulator
c. the battery
d. the headlamp assy

7. The major component of the automobile electrical systems is

____ a. battery
b. voltage regulator
c. alternator
d. diode rectifiers

MODULE 13.0

ESTIMATE BODY REPAIRS

The purpose of this module concerning estimating vehicle body repair and painting jobs is to introduce the student to the basic terminology and procedures of job estimating and cost control.

AUTO BODY
ESTIMATE BODY REPAIRS
SUGGESTED INSTRUCTION TIMES

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 13.0	ESTIMATE BODY REPAIRS	
13.01	Distinguish Between Indirect and Direct Damage	*
13.02	Determine Required Repairs and Replacement for a Given Damaged Vehicle	*
13.03	Compute Cost of Parts and Labor for a Damaged Vehicle	*
13.04	Determine Materials for a Paint Job	*
13.05	Estimate Cost of Paint Job	*
13.06	Estimating Cost of Painting	*
13.07	Complete an Estimate Form	*
13.08	(OPTIONAL) Emphasize Cost Control	*
	TOTAL	30

*Integrated training

TASK LISTINGS
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 13.0	ESTIMATE BODY REPAIRS
13.01	(Distinguish Between Indirect and Direct Damage) Given a damaged vehicle with direct damage such as tears, scratches, and gouges at points of impact and indirect damage such as buckles such as the simple hinge, collapsed hinge, simple rolled, and collapsed rolled buckles; distinguish between indirect and direct damage.
13.02	(Determine Required Repairs and Replacements for a Given Damaged Vehicle) For a given collision-damaged vehicle, using reference material provided; determine required repairs and replacements. Repairs and replacements identified must be in accordance with predetermined repair and replacement requirements. Repairable parts must not be listed for replacements.
13.03	(Compute Cost of Parts and Labor for a Damaged Vehicle) Using a given list of identified repairs and replacements, hourly rates, parts manuals, and a collision guide; compute the cost of parts and labor. Computation must agree with the instructor's predetermined estimate (100 percent if not otherwise specified).
13.04	(Determine Materials for a Paint Job) For a given vehicle requiring a paint job, given paint materials catalogs; determine the materials for the paint job to include: Type and quantity of thinner, solvents, and primer; type, quantity, and color of paint and paint additives, amount of tape, tack rags, grease and wax remover; and sandpaper within +/- 5 percent of a predetermined estimate.
13.05	(Estimate Cost of Paint Job) Provided a list of materials and paint and catalogs, estimate cost of paint job. The estimate must include individual and total costs for the type and quantity of thinner, solvents, and primer; the type, and quantity, and color of paints and paint additives; and the amount of tape, tack rags, grease and wax remover, and sandpaper within +/- 5 percent or predetermined cost.

13.06 (Estimating Cost of Painting) For a damaged vehicle requiring a cost estimate or using a given list of materials, paint, and catalogs, make an estimate for the paint job. The estimate must include individual and total costs for the type and quantity of thinner, solvents, and primer; the type and quantity, and color of paints and paint additives, and the amount of tape, tack rags, grease and wax remover, and sandpaper. The estimate must be within +/- 5 percent of the instructor's predetermined estimate.

13.07 (Complete an Estimate Form) See following page for task objective description.

13.08 (Emphasize Cost Control) Given auto body repair or painting and the necessary instruction concerning cost control and required forms; emphasize cost control in completing work orders, record of time spent on the job, record of parts and materials used on the job, and margin of profit on parts and materials. Performance must be to the standards of the instructor.

MODULE 13.0 ESTIMATE BODY REPAIRS

TASK 13.01 DISTINGUISH BETWEEN INDIRECT AND DIRECT DAMAGE

PERFORMANCE OBJECTIVE:

Given a damaged vehicle with direct damage such as tears, scratches, and gouges at points of impact and indirect damage such as buckles such as the simple hinge, collapsed hinge, simple rolled, and collapsed rolled buckles; distinguish between indirect and direct damage.

PERFORMANCE ACTIONS:

13.0101 Inspect given vehicle.

13.0102 Identify indirect damage (that usually will be repaired first).

13.0103 Identify direct damage.

PERFORMANCE STANDARDS:

- Distinguish between indirect and direct damage on a given vehicle.
- The student's findings must be in agreement with the findings of the instructor and performance must be to the instructor's standards.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Describe that direct damage takes three forms: Tears, scratches, and gouges.
- Identify that direct damage results at the exact point of impact.
- Describe indirect damage as other damage on the panel including all forms of buckles: Simple hinge, collapsed hinge, simple rolled, and collapsed rolled.
- Identify that indirect damage makes up about 80 percent - 90 percent of all damage that occurs to a vehicle.

(NOTE: Actions to be clarified by instructor.)

TASK 13.02 DETERMINE REQUIRED REPAIRS AND REPLACEMENTS FOR A GIVEN DAMAGED VEHICLE

PERFORMANCE OBJECTIVE:

For a given collision-damaged vehicle, using reference material provided; determine required repairs and replacements. Repairs and replacements identified must be in accordance with predetermined repair and replacement requirements. Repairable parts must not be listed for replacements.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Identify reference materials needed to determine repairs and replacements for a damaged vehicle.
- Identify vehicle parts by manufacturer's nomenclature.
- Distinguish between: Parts needing replacement and parts that can be repaired.

TASK 13.03 COMPUTE COST OF PARTS AND LABOR FOR A DAMAGED VEHICLE

PERFORMANCE OBJECTIVE:

Using a given list of identified repairs and replacements, hourly rates, parts manuals, and a collision guide; compute the cost of parts and labor. Computation must agree with the instructor's predetermined estimate (100 percent if not otherwise specified).

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Compute basic math problems (8th grade level).
- Describe/demonstrate how to correctly use a collision guide.
- Describe how to compute overlap or special charges.
- List factors which can become hidden costs.
- Describe basic types of estimates.

TASK 13.04 DETERMINE MATERIALS FOR A PAINT JOB

PERFORMANCE OBJECTIVE:

For a given vehicle requiring a paint job, given paint materials catalogs; determine the materials for the paint job to include: Type and quantity of thinner, solvents, and primer; type, quantity, and color of paint and paint additives, amount of tape, tack rags, grease and wax remover; and sandpaper within +/- 5 percent of a predetermined estimate.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Describe how to use a paint and materials catalog.
- Describe procedure for determining type, quantity, or/and color of: Thinner, solvents, primer, paint, paint additive, tack rags, grease and wax remover, and sandpaper.

TASK 13.05 ESTIMATE COST OF PAINT JOB

PERFORMANCE OBJECTIVE:

Provided a list of materials and paint and catalogs, estimate cost of paint job. The estimate must include individual and total costs for the type and quantity of thinner, solvents, and primer; the type, and quantity, and color of paints and paint additives; and the amount of tape, tack rags, grease and wax remover, and sandpaper within +/- 5 percent of predetermined cost.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Determine unit cost of each material.
- Determine procedure for cost estimate.
- Identify required form, if appropriate.
- Perform basic math calculations (8th grade level).

TASK 13.06 ESTIMATING COST OF PAINTING

PERFORMANCE OBJECTIVE:

For a damaged vehicle requiring a cost estimate or using a given list of materials, paint, and catalogs; make an estimate for the paint job. The estimate must include individual and total costs for the type and quantity of thinner, solvents, and primer; the type and quantity, and color of paints and paint additives, and the amount of tape, tack rags, grease and wax remover, and sandpaper. The estimate must be within +/- 5 percent of the instructor's predetermined estimate.

(ALTERNATE TASK: Given local average cost figure for estimating body and paint repairs or paint repairs, estimate given jobs within 10 percent of the estimate of the instructor.)

SUGGESTED INSTRUCTION TIME: * (Integrated training)

RELATED TECHNICAL INFORMATION:

- Determine unit cost for each material.
- Describe/demonstrate procedure for performing a cost estimate.
- Perform math calculations (8th grade level).

TASK 13.07 COMPLETE AN ESTIMATE FORM

(SEE FOLLOWING PAGE FOR TASK OBJECTIVE DESCRIPTION)

TASK 13.08 EMPHASIZE COST CONTROL

PERFORMANCE OBJECTIVE:

Given auto body repair or painting and the necessary instruction concerning cost control and required forms; emphasize cost control in completing work orders, record of time spent on the job, record of parts and materials used on the job, and margin of profit on parts and materials. Performance must be to the standards of the instructor.

MODULE 13.0 ESTIMATE BODY REPAIRS

TASK 13.07 ESTIMATE COST OF REPAIRS

PERFORMANCE OBJECTIVE:

Provided with a vehicle with (a) paint, (b) body, and/or (c) frame damage and the necessary instruction, references, and tools or equipment; estimate and record the cost to repair the vehicle to manufacturer's specifications and so that it will be safe to drive.

PERFORMANCE ACTIONS:

13.0701 Determine if estimate is to include:

a. Frame
b. Body
c. Paint

13.0702 Obtain proper estimating forms.

13.0703 Inspect damage.

13.0704 Make necessary measurements, etc.

13.0705 List damaged parts to be replaced or straightened in their proper sequence.

13.0706 Assemble parts manuals and pricing information.

13.0707 Price parts and labor from estimating manuals.

13.0708 Total parts and labor and add sales tax.

13.0709 Submit estimate(s) to instructor for evaluation.

PERFORMANCE STANDARDS:

- Estimate cost of repairs for (a) paint, (b) body, and/or (c) frame damage using proper inspection and measurement methods and basing estimate on estimating manuals provided by the instructor.
- Estimate must be within 10 percent agreement of instructor's findings.

SUGGESTED INSTRUCTION TIME: * (Integrated training)

TASK 13.07 ESTIMATE COST OF REPAIRS (Con't.)

RELATED TECHNICAL INFORMATION:

- Mitchell's Estimating Guide or equivalent.

SEE ADDENDUMS:

1. Suggested Minimum Check Points.
2. Repair Estimate Form.

TASK EXPANSION:

- Estimate to refinish a door.
- Estimate to straighten and refinish a door.
- Estimate to straighten a front and rear door.
- Estimate to straighten and replace parts on a front end assembly.
- Estimate to straighten and replace parts on a total.

SUGGESTED MINIMUM CHECKPOINTS

FRONT END DAMAGE:

- Front bumper ______________________
- Grille ______________________
- Front body ______________________
- Front lamps ______________________
- Hood ______________________
- Front fender(s) ______________________
- Front suspension ______________________
- Wheels & brakes ______________________
- Steering linkage ______________________
- Steering column ______________________
- Windshield ______________________

FRAME AND UNDERBODY:

- Frame ______________________
- Exhaust ______________________
- Front suspension ______________________
- Wheel & Brakes ______________________
- Fuel tank ______________________
- Rear axle ______________________
- Rear suspension ______________________

TOP, SIDES, INTERIOR:

- Cowl & Dash ______________________
- Rocker panel and center pillar ______________________
- Seat ______________________
- Front and rear doors ______________________
- Windshield ______________________
- Roof ______________________
- Convertible top ______________________

REAR DAMAGE:

- Back window ______________________
- Quarter panel ______________________
- Quarter glass and parts ______________________
- Quarter molding ______________________
- Luggage lid ______________________
- Rear bumper ______________________
- Rear body ______________________
- Rear lamp ______________________
- Rear gate ______________________
- Deck lid ______________________

ACME BODY SHOP

REPAIR ESTIMATE

NAME

DATE

PHONE: Home:

Bus:

ADDRESS

CAR MODEL and YEAR

Paint Code Number

License Number

I. D. Number

Mileage

ITEM NO.	DESCRIPTION OF REPAIR OPERATIONS	IN HOURS	PARTS PRICES
	Totals		

Sublet costs

Total	

Labor costs	
Material costs	
Sublet	
Subtotal	
Tax	
Grand Total	

Module 13.0

STUDENT: ______________________________ DATE: _______________

1. An estimate is ____.

____ a. an educated guess
b. a contract
c. exact cost of repairing a wrecked car
d. a guide for repairs

2. A crash manual is used to get ____.

____ a. price of parts
b. price of labor
c. price of both parts and labor
d. parts numbers

3. When inspecting a damaged car, the first question to answer is ____.

___ a. How much does the damaged panel cost?
b. Is the car repairable?
c. Can the car be towed?
d. How much paint is required?

4. Indirect body damage is usually characterized by ____.

____ a. damage to the paint finish
b. damage at point of impact
c. distortion of bumpers
d. buckles and ridges appearing some distance from the point of impact

5. Which one of the following is the most common type of estimate?

____ a. courtesy
b. competitive
c. non-competitive
d. manufacturer's

Module 13.0

STUDENT: ______________________________ DATE: ______________

PERFORMANCE TEST:

1. Estimate the repair of a given vehicle

   Using forms and references provided by the instructor, estimate a minimum of two automobile repairs to include body work and painting. Estimates must be within 10 percent of predetermined estimates by the instructor. Performance must be to the instructor's standards.

Vehicle 1

____

Attach estimate sheet

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

Vehicle 2

____

Attach estimate sheet

COMPETENCY LEVEL: 0 ( )
COMPETENCY LEVEL: 1 ( )
COMPETENCY LEVEL: 2 ( )
COMPETENCY LEVEL: 3 ( )
COMPETENCY LEVEL: 4 ( )

ANSWER KEY TO COMPETENCY TEST

Auto Body Task Force Committee instructor participants are reviewing the competency test and preparing an answer key for field trial use.

If the answer key is not completed as this guide is reproduced and distributed, the answer key will be distributed at the beginning of the 1984-1985 Fall school term for use during the field trial year.

MODULE 14.0

AUTO BODY LIVE PROJECTS

AUTO BODY
AUTO BODY LIVE PROJECTS
SUGGESTED INSTRUCTION TIME

AUTO BODY MODULE/TASK		SUGGESTED HOURS
Module 14.0	AUTO BODY LIVE PROJECTS	
14.01	Auto Body Repair and Refinishing	N/A

TASK LISTING
AUTO BODY

MODULE/TASK	DESCRIPTION
Module 14.0	AUTO BODY LIVE PROJECTS
14.01	(Auto Body Repair and Refinishing) Upon satisfactory mastery of the necessary basic auto body and refinishing competencies; given instruction and supervision in body repair and refinishing; a live vehicle to repair; the necessary tools, equipment, repair/ replacement parts, materials and necessary reference data such as manufacturer's manuals; as well as a helper if needed; demonstrate the minimum skills and knowledges required for successful entry level employment in inspecting vehicle damage, determining repairs to be made, estimating repair costs, and making the indicated repairs to the manufacturer's specifications, instructor's standards, or satisfaction of the customer.

MODULE 14.0 AUTO BODY LIVE PROJECTS

TASK 14.01 AUTO BODY REPAIR AND REFINISHING

PERFORMANCE OBJECTIVE:

Upon satisfactory mastery of the necessary basic auto body and refinishing competencies; given instruction and supervision in body repair and refinishing; a live vehicle to repair; the necessary tools, equipment, repair/replacement parts, materials and necessary reference data such as manufacturer's manuals; as well as a helper if needed; demonstrate the minimum skills and knowledges required for successful entry level employment in inspecting vehicle damage, determining repairs to be made, estimating repair costs, and making the indicated repairs to the manufacturer's specifications, instructor's standards, or satisfaction of the customer.

PERFORMANCE ACTIONS:

The enabling objectives or actions are those outlined in this Articulated, Performance-based Instruction Objectives Guide for Auto Body Repair, if not superseded by the manufacturer's information or the instructor's standards.

PERFORMANCE STANDARDS:

- The repair or refinishing of a vehicle must be satisfactorily accomplished according to the manufacturer's specifications unless otherwise specified by the instructor or owner.
- Repair and refinishing must not result in additional damage to the vehicle.
- Half-way repair jobs should not be accepted. If the customer insists on shortcuts to save a few pennies, the job should be refused. Emphasis will be on doing the repair or refinishing "right" or not at all. (The instructional situation must adhere to minimum standards in teaching students the proper way to accomplish a job.)

SUGGESTED INSTRUCTION TIME: Time is not specified since it will vary according to the job and since more than one live project probably will be undertaken during the two year secondary training period.

The project performance/job time, however, must meet the instructor's standards.

RATIONAL FOR LIVE AUTO BODY REPAIR AND REFINISHING:

Live auto body repair and refinishing provide the opportunity where the secondary student can apply theoritical training and practice to simulated or actual job situations.

Shop jobs will be coordinated as closely as possible with theoritical training so that the student logically moves from the study of the fundamentals to practical exercises and finally to live project competency testing.

Typically, students can bring or accept any type of body repair or refinishing where instruction has been given and competencies have been mastered. Sometimes, however, the auto body program may need to take advantage of "repair opportunities" that may not be repeated at a later date, and, under the supervision of the instructor, basic instruction and repair or refinishing may be conducted together in a live situation.

Generally, the production of the auto body secondary student in the training lab (shop) will be low and slow compared to industry because the primary aim is on teaching. Emphasis in the auto body repair program is placed on developing the correct skills for auto body mechanic refinishing work. A job not done "right" may have to be done over by the student.

Live auto body repair and refinishing work provides a unique opportunity for students to encounter, in a controlled setting, day-to-day body repair and refinishing problems that cannot be simulated. The "hands on" work in the shop provides learning experiences that otherwise only can be acquired through trial-and-error.

Worthwhile live training projects, however, require more instructor planning. Careful scheduling is necessary to ensure that students are competent to accomplish the job within the given time and resources. In addition, live shop jobs must be scheduled in the proper instructional sequence so that student teams can complete the job and so that repairs or refinishing proceeds properly.

Practical learning opportunities in live shop projects may be designed for special needs students, for the career interests of students, or to meet the needs of potential employers at a particular time. A secondary student already working in the auto body repair or refinishing related field may be able to develop specialized competencies through "additional experiences" gained in live shop projects.

RATIONAL FOR LIVE AUTO BODY REPAIR AND REFINISHING (Con't.):

Live shop body repair and refinishing jobs provides the instructor with an optimum situation in which to test student knowledges and skills in realistic, "hands-on" examinations. In some situations, the live shop job may be utilized by the instructor as a method of conducting a final examination of a unit or units of instruction.

A side benefit that often accompanies live shop repair or refinishing work is when students tend to develop good work habits and attitudes in addition to increasing their technological knowledges and skills in auto body repair and refinishing.

SUGGESTIONS FOR SHOP PROJECTS

1. Each live project job should begin with a clear, concise written repair or refinishing order. (Shop work should observe Federal, State, and local requirements.)
2. Repairs and refinishing work should not begin until a specified repair order and deposit to cover costs of estimated parts and materials has been obtained. The educational organization should not be expected to pay unpaid repair or refinishing expenses from the instructional budget.
3. All repair and refinishing work undertaken should be compatible with the curriculum objectives. Students should not undertake work until they have been introduced to the appropriate theory, techniques, or procedures.
4. Each repair or refinishing job should have appropriate checkpoints established and work should not progress beyond checkpoints until the job has been inspected by the instructor.
5. Vehicles taken in the shop to be repaired or refinished should be protected with appropriate covers, etc., and the vehicles should be cleaned appropriately after the work has been accomplished.
6. Students should be able to verbally describe the objectives and purposes of the specific repair or refinishing jobs they are to perform.
7. A record or log should be kept of all parts and materials used in the repair or refinishing work.
8. Students should record their time involved in repair or refinishing work and indicate their name on the job records (repair/refinishing order).
9. Students should not enter a vehicle except to perform authorized repair or refinishing work.
10. Radios or audio equipment or accessories in vehicles should not be operated while the vehicle is waiting repairs/pick-up.
11. No work should be done under a vehicle unless proper safety procedures are followed.
12. After repairs or refinish work are finished, the vehicle engine should not be started until the instructor is present. Once repairs/refinishing are complete and the vehicle is parked for pick-up, it should not be moved without permission from the instructor.

13. All repair and refinishing work should be checked by the student and approved by the instructor.

14. Body repair and refinishing jobs must not be rushed and half-way work should be refused.

15. Only students with a valid driver's license should drive a vehicle in or out of the shop.

16. Prior to releasing a vehicle, the instructor should verify the repair or refinishing work and should obtain a limited release of responsibility from the customer.

Adopted from:

Henderson, W. E. (ed), Articulated, Performance-based Instruction Objectives Guide for Automotive Mechanics, Greenville, SC: The School District of Greenville County (Occupational Education Articulation Program funded by the South Carolina Appalachian Council of Governments), pp. 420-421, 1983.

Henderson, W. E., Automotive Mechanics Program Guide, 1970 (unpublished).

Standards for Vocational Automotive Service Instruction, Detriot, MI: Motor Vehicle Manufacturer Association of the United States, Inc., p. 58, 1970.

SHOP PROJECTS: ____

RELATED CURRICULUM TOPIC: ________________________________

TASK NOS: ______, ______, ______, ______, ______

PERFORMANCE OBJECTIVE:

(What is student given? What behavior is expected of student? What standard of performance is expected?)

DESCRIBE MAJOR STEPS OF TASK (JOB):	STEPS COMPLETED WHEN BELOW STANDARDS DEMONSTRATED
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

STANDARDS (CRITERIA) OF PERFORMANCE THAT INDICATES THAT STUDENTS HAS COMPLETED TASK:

PLANNED INSTRUCTIONAL TIME: ______ Hours

(Estimated travel to/from: ______ Hours On Job: ______ Hours)

DATE TASK STARTED: ____________ DATE TASK FINISHED: ____________

RELATED KNOWLEDGE TRAINING	RELATED SKILL TRAINING

NOTES/COMMENTS:

INSTRUCTOR: ATTACH PLANS, INSTRUCTIONS, TESTS, ETC.

TASKS OMITTED
FROM
SECONDARY GUIDE

Tasks omitted from this articulated, secondary level instruction guide for auto body repair have been classified as optional areas of training and are omitted based on instructional time allocations, the possibility that the task might typically be performed as a specialized service, or based on available shop facilities, equipment, materials or funds.

Tasks omitted include the following:

- Vinyl top service
- Upholstery
- Convertible top service
- Automotive electrical service, other than minor repair and replacement, directly related to auto body disassembly, assembly, and repair.
- Automotive mechanics, other than typical repairs, and replacements directly related to auto body disassembly, assembly, and repair.
- Frame straightening, other than minor frame alignment and straightening, due to a lack of frame equipment necessary for frame straightening training and due to a limit on the time allocated for training. (It is recommended that students continue training at Greenville Technical College to learn frame straightening and major collision body work.)

PROFICIENCY REPORT

PROFICIENCY REPORT
for

____
Vocational Course

Student: ____

High School: ____

Career Center: ____

Date Training Initiated: ____________
First Year Completed: ____________
Second Year Initiated: ____________
Second Year Completed: ____________

Instructor: ____

DIRECTIONS: The purpose of the proficiency report is to communicate to the student, other instructors, or potential employers the abilities that a student has demonstrated to the instructor in vocational training. Mark each task as soon as possible after instruction or skills demonstrated. If instruction is not aimed as task proficiency, or if only an orientation or introduction to the task was provided, DO NOT mark a proficiency level or mark Level 0. Levels 1-4 indicate that instruction was given and the proficiency may be interpreted as follows:

Level 0	No skill level demonstrated or proficiency training not given in the skill.
Level 1	Individual's skill level is not that generally expected for entry level employment.
Level 2	Individual's skill level probably is that generally expected for entry level employment, but the individual probably will need close on-the-job supervision for a while longer.
Level 3	Individual's skill level is that generally expected for entry level employment.
Level 4	Individual's skill level is equal to that of a worker with some on-the-job experience.

For further description of the levels of proficiency, see the "Credentialing Process and Proficiency Report" section of the Policies and Procedures Guide for Articulation Between The School District of Greenville County and Greenville Technical College.

STUDENT ____

PROFICIENCY REPORT

AUTO BODY REPAIR

			Proficiency					
			Level 0	Level 1	Level 2	Level 3	Level 4	Date Completed
MODULE	1.0	INTRODUCTION/ORIENTATION						
	1.03B	Observed Classroom Safety Practices						
	1.01C	Worked Cooperatively With Fellow Students						
	1.02C	Demonstrated Desirable Characteristics of Leadership						
	1.01E	Demonstrated Good Work Habits Important to Job Success						
	1.02E	Exhibited Successful Job Performance Characteristics						
	1.03E	Exhibited Desirable Work Attitudes						
	1.04E	Demonstrated Respect for and Care of Auto Body Property						
MODULE	2.0	INTRODUCTION TO AUTO BODY REPAIR						
	2.01	Identified and Used Automotive Fasteners						
MODULE	3.0	INTRODUCTION TO BODY AND FRAME CONSTRUCTION						
	3.01	Identified Parts of Typical Auto Body Construction						
	3.02	Identified Typical Auto Frame Construction and Explained Importance of Frame Alignment						
MODULE	4.0	TOOLS AND EQUIPMENT						
	4.01	Correctly Used Auto Mechanics (General) Hand Tools						
	4.02	Correctly Used Auto Body Repair Hand Tools						
	4.03	Used Power Tools and Equipment						
	4.04	Used Frame and Underbody Repair Tools and Equipment						
	4.05	Identified and Properly Used Common Automotive Shop Machinery						
MODULE	5.0	WELDING						
Unit	5.0 A	OXYACETYLENE (OAW) CUTTING/ WELDING AND BRAZING						
	5.01	Introduced to Oxyacetylene Cutting/Welding Terminology						

			Proficiency Level 0	Level 1	Level 2	Level 3	Level 4	Date Completed
	5.03	Performed Soap and Water Test (Safety)						
	5.04	Identified Oxygen and Acetylene Gases and Cylinder Handling						
	5.05	Set Up Oxyacetylene Cutting/ Welding Station						
	5.07	Light the Torch						
	5.08	Adjusted Flame						
	5.09	Cut With Oxyacetylene						
	5.10	Prepared the Joint						
	5.11	Carrying the Puddle (Fuse)						
	5.12	Ran a Bead With Filler Rod						
	5.13	Welded With Oxyacetylene						
	5.15	Brazed Sheet Metal						
Unit	5.0 B	SHIELDED METAL ARC WELDING						
	5.01	Introduced to Arc Welding Principles						
	5.03	Set Up Machines and Accessories						
	5.04	Select Electrode						
	5.05	Demonstrated Striking and Maintaining (Substaining) an Arc (Flat Position)						
	5.09	Prepared Joint						
Unit	5.0 C	GAS METAL ARC WELDING (GMAW) /MIG/						
	5.01	Introduced to GMAW (MIG) Welding						
	5.03	Set Up and Shut Down GMAW (MIG) Equipment						
	5.06	Welded Sheet Metal by Mig Process						
Unit	5.0 D	APPLIED WELDING						
	5.01	Welded Vehicle Body Panel						
	5.02	Welded a Scab Patch						
MODULE	6.0	METALWORKING INTRODUCTION						
Unit	6.0 A	METALWORKING						
	6.01	Demonstrated Hammer-on Technique						
	6.02	Demonstrated Hammer-off Technique						
	6.03	Picked, Filed, and Finished Metal						
	6.04	Pulled (Removed) Minor Dents Using Slide-Hammer and Pull Rods						
	6.05	Used Spoon to Remove Dents						
	6.06	Straighten Deformed Auto Body Sheet Metal						
	6.07	Able to Heat Shrink Metal						
	6.08	Able to Cold Shrink Metal						
Unit	6.0 B	METALWORKING - BODY FILLERS						
	6.01	Filled Small Holes With Solder (Lead)						

			Proficiency Level 0	Level 1	Level 2	Level 3	Level 4	Date Completed
Unit	8.0 B	TRIM, ACCESSORIES, AND HARDWARE (EXTERIOR)						
	8.01	Removed, Replaced, and Aligned Door Locks and Mating Parts						
	8.02	Removed, Replaced, and Aligned a Trunk Lock and Mating Parts						
	8.03	Removed, Replaced, and Aligned Hood Latch and Mating Parts						
	8.04	Removed and Installed Weatherstripping						
	8.05	Removed and Replaced a Bumper						
	8.06	Removed and Replaced a Grille						
	8.07	Removed and Replaced a Vinyl Top						
	8.08	Removed/Replaced Sun Roof or T-Roof Assembly						
MODULE	9.0	DISASSEMBLE & ASSEMBLE PANELS, ETC. (REMOVE AND REPLACE)						
	9.01	Removed and Installed Door						
	9.02	Removed and Replaced Bolt-on Panel						
	9.03	Removed and Replaced Weld-on Panel						
	9.04	Removed and Replaced and Aligned Hood and Deck Lids						
	9.05	Removed a Complete Front End Assembly						
	9.06	Removed and Replaced Bolt-in Radiator Supports						
	9.07	Removed and Replaced Headlamp Assembly						
	9.08	Removed and Replaced Fuel Tank						
MODULE	10.0	GLASS REPLACEMENT						
	10.01	Removed and Replaced Stationary Glass as Helper						
	10.02	Removed and Installed a Windshield-Mounted Rearview Mirror						
	10.03	Removed and Replaced Regulator-Controlled Movable Glass						
	10.04	Located and Sealed Leaks Around Windshield or Rear Window						
	10.05	Replaced Power Window Motor						
MODULE	11.0	BASIC BODY AND FRAME ALIGNMENT						
	11.01	Determined Conventional Body Shell and Frame Alignment						
	11.02	Aligned Conventional Body Shell and Frame						

			Proficiency					
			Level 0	Level 1	Level 2	Level 3	Level 4	Date Completed
	11.03	Repaired Frame Horns and Cross Members						
	11.04	Overhauled Conventional Suspension						
	11.05	Determined Type of Frame Damage and Required Repairs						
MODULE	12.0	ELECTRICAL SYSTEM REPAIRS/ REPLACEMENTS						
	12.01	Removed and Replaced a Battery						
	12.02	Removed and Replaced a Fuse						
	12.03	Perform an Operational Test of External Lighting Circuits						
	12.04	Removed and Replaced a Bulb						
	12.05	Removed and Replaced a Headlight						
	12.06	Removed and Replaced a Socket						
	12.07	Removed and Replaced a Horn Relay						
	12.08	Removed and Replaced Antenna Assembly						
	12.09	Replaced a Power Solenoid						
MODULE	13.0	ESTIMATE BODY REPAIRS						
	13.01	Distinguished Between Indirect and Direct Damage						
	13.02	Determined Required Repairs and Replacements for a Given Damaged Vehicle						
	13.03	Computed Cost of Parts and Labor for a Damaged Vehicle						
	13.04	Determined Materials for a Paint Job						
	13.05	Estimated Cost of Paint Job						
	13.06	Estimating Cost of Painting						
	13.07	Completed an Estimate Form						
	13.08	Emphasized Cost Control						
MODULE	14.0	AUTO BODY LIVE PROJECTS IN REPAIR AND REFINISHING (DESCRIBE) ACCEPTABLE						

COMMENTS:

INSTRUCTOR'S SIGNATURE ______________________________

			Proficiency					
			Level 0	Level 1	Level 2	Level 3	Level 4	Date Completed
	6.02	Mixed and Applied Plastic Body Filler						
	6.03	Used Fiberglass to Restore Damaged Area						
2ND YEAR								
MODULE	7.0	PAINTING AND REFINISHING						
	7.01	Located Paint Code and Determined Materials for Painting Repair						
	7.02	Cleaned Metal Surfaces for Undercoat						
	7.03	Sanded Metal Surfaces for Undercoat						
	7.04	Featheredged All Broken Areas of Finish						
	7.05	Masked Sections and Parts						
	7.06	Cleaned and Adjusted Spray Gun						
	7.07	Demonstrated Proper Technique in Using Spray Gun						
	7.08	Applied Primer-Surfacer (Undercoat)						
	7.09	Apply Color Coats						
	7.10	Cleaned and Compounded a Painted Surface Polishing by Hand and With Buffer						
	7.11	Air/Heat Dried Painted Surface						
	7.12	Removed and Applied Decals and Stripes						
	7.13	Replaced Woodgrain Panels						
	7.14	Detailing and Exterior and Interior Clean-up						
MODULE	8.0	TRIM, ACCESSORIES, AND HARDWARE						
Unit	8.0 A	TRIM, ACCESSORIES, AND HARDWARE (INTERIOR)						
	8.01	Removed and Replaced Interior Molding						
	8.02	Removed and Replaced Trim Panels						
	8.03	Removed and Replaced a Padded Dashboard						
	8.04	Removed and Replaced Seat and Shoulder Belts						
	8.05	Removed and Replaced Front and Rear Seats						
	8.06	Removed and Replaced Seat Tracks						
	8.07	Removed and Replaced Power Seat Controls						

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APPENDIXES

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APPENDIX A

THE SCHOOL DISTRICT
OF GREENVILLE COUNTY

GREENVILLE TECHNICAL COLLEGE

TO: All Administrators, Staffs and Faculties, The School District of Greenville County and Greenville Technical College

SUBJECT: Application and Implementation of the Policies and Procedures for the Articulation of Similar Vocational Training Programs of Instruction

Since 1976, The School District of Greenville County and Greenville Technical College have been working toward making the articulation of vocational education programs a viable and valid reality. Through joint efforts in the Occupational Education Articulation Program, The School District of Greenville County and Greenville Technical College fully support the concept of articulation and agree upon the purposes of the articulation program.

This Policies and Procedures Guide has been developed as a joint effort of The School District of Greenville County and Greenville Technical College with the assistance of individuals representing the institutional administrative units, involved faculty, and the local business and industrial community. The Policies and Procedures Guide is designed to assist the articulation of very similar programs of vocational training between the secondary and post-secondary, public, vocational training institutions in Greenville County.

Appreciation is expressed to participants at both institutions for the joint effort of this endeavor.

J. F. Hall
J. F. Hall
Superintendent
The School District of
Greenville County

Thomas E. Barton
Thomas E. Barton
President
Greenville Technical College

TASK FORCE COMMITTEE AGREEMENT TO ARTICULATE VOCATIONAL EDUCATION

Articulation provides a system whereby secondary and post-secondary instructors can cooperate effectively in providing a continuous occupational development program where the level and type of vocational training that leads to entry-level employment skills will be clear to instructors, other educators, students, and potential employers.

The concept of articulation and the articulation program are supported fully be The School District of Greenville County and Greenville Technical College which have agreed upon a statement of purpose for the articulation of similar vocational education programs in Greenville County.

The articulation program in Greenville County is a joint effort of The School District of Greenville County and Greenville Technical College to develop a continuous program of vocational training so that students may continue their career preparation without loss of time or waste of effort in repeating tasks which have been learned previously and demonstrated. Articulation program activities are designed to help remove unnecessary gaps or overlap in student learning which may occur when a student completes a secondary vocational program and continues career development at the post-secondary level in a similar occupational field.

To implement articulation, instructor representatives from the participating institutions have met as a task force committee to develop this articulated, performance-based instruction guide which describes the secondary vocational program and which provides the parameters for vertical articulation.

Vertical articulation shall include recognition of the occupational competencies demonstrated by secondary graduates of articulated vocational programs.

It is agreed that...

The task force committee instructor representatives from The School District of Greenville County and Greenville Technical College mutually recognize the value of occupational education provided by each institution.

The task force committee instructor representatives will take the necessary actions, approved by their administrations, to ensure that this agreement to articulate is fulfilled including interpreting the program to students.

It is understood that periodic review of the articulated task objectives, performance actions, minimum standards, and outcome-referenced measures will be necessary to ensure that a valid training program is serving the needs of the community and the students.

Each task force committee participant hereby agrees to notify the others of any changes which modify the articulated, performance-based vocational program described in this guide so that each articulation guide, and where appropriate the articulation program, may be revised mutually so that articulated occupational training in Greenville County will conform to the minimum standards outlined in this guide.

This agreement to articulate establishes the necessary framework for lateral as well as vertical articulation.

AGREED UPON BY THE TASK FORCE COMMITTEE PARTICIPANTS ON THIS DAY,

March 29, 1984
date

Name	Institution/School
Harald Hall	Enoree V.C
Charles Bentley	Golden Strip C.C
Linda McMillan	Greenville Tech

PHILOSOPHY OF ARTICULATED, PERFORMANCE-BASED INSTRUCTION GUIDE DESIGN

The design of the articulated, performance-based instruction guides and the articulation program is based on a philosophy that the vocational education curriculum should be for career training with few fringe or non-related subjects. The student should be given the basis to do useful skilled work upon graduation and employment. The vocational program graduate should have a background which will allow him/her to learn and advance as rapidly as possible on the job, but it should not include subject matter which will not be applicable to his/her work for years. When subject matter is introduced that will not be applicable to the graduate's work for years, it may put the graduate out of perspective. The result might be that the graduate may try to force applications which do not exist, simply because the information is in his/her repertoire. Thus, the purpose of vocational training by the articulated, performance-based instruction guides is to prepare graduates for successful entry into a skilled trade.

To ensure that the design of the articulated, performance-based instruction guides is conforming to the philosophies of both the secondary and post-secondary institutional participants, a periodic review of the guide design and philosophy is recommended.

PURPOSES OF THE ARTICULATED INSTRUCTION GUIDE

The articulated instruction objectives guide are is expected to serve the following purposes:

1. The guide serves as the primary vehicle for the articulation of subject matter in similar vocational training programs between the vocational education centers, high schools, and Greenville Technical College through use by instructors at both levels as a reference in preparing instruction.

2. The guide provides a listing of the minimum tasks that a student or worker is expected to perform in the conduct of a specific level job in the area of vocational training or work of concern.

3. The guides identify the primary detailed instruction objectives, performance objectives which are based upon the task listings. The tasks are listed in the sequence of complexity, with the least complex task being listed first, except where a task must be performed as a prerequisite to performance of another task.

4. The guides identify the tasks performed (actions, steps, sets of skills) and related technical information which must be taught and learned to accomplish each major instruction objective. The tasks performed represent the minimum skills and related information required for adequate occupational proficiency in the performance objectives.

5. The guides designate the instructional contact hours necessary to provide the required instruction, as required by appropriate educational agencies or offices and as estimated by the instructor-participants on the Vocational Articulation Project Task Forces, and based on the time required to teach the average learner to perform the task. The time estimated is based on having the essential equipment, facilities and instructional aids required to provide the instruction, whenever the class size is limited to an acceptable number.

6. The guides identify the performance standards to be met for occupational proficiency in the task. Performance standards used are those considered to be minimum business or industry standards. The ability to meet the listed standards of performance will be considered as qualification for advanced instruction in the vocational program.

7. The guides provide direction in the conduct of sequential vocational competency instruction by modules or job tasks, resulting in qualification by the learner to perform limited skill specialist jobs of

progressively higher skills until the program objective is reached (i.e., file clerk to executive secretary, etc.). As the student becomes proficient in the performance of tasks in successively more complex modules, more marketable competencies are gained and may be identified as the lower job qualifications of a specialist.

Through this procedure, even the slower student is provided an opportunity to eventually gain sufficient skills to perform adequately as a specialist at some level in the vocational field, even if the student is unable to complete the total program of training.

The standardized sequence of activities of the vocational instruction modules will facilitate lateral articulation between vocational education centers in the School District and will simplify vertical articulation when training is continued at Greenville Technical College articulating to employers.

8. The guides provide a descriptive listing of equipment required to conduct the program of vocational training. The equipment listed is considered to be the type and quantity essential for the conduct of instruction to prepare students for entry-level employment in the vocational field. It may be necessary to delay teaching some tasks involving special equipment, if that equipment is not available at all instructional sites, or to move students and equipment together as necessary to teach skills.

9. The guide provides information about requirements or limitations that typically are involved in the performance of the task, environmental conditions and physical demands, and able to perform the task.

10. The guides provide a list of standardized performance test items/ and outcome-referenced measures to be used in the determination of vocational proficiency. As long as the specifics are not provided, the test items listed cannot be compromised easily and could serve as study guides.

11. The tasks listed in the guide are the minimum requirements for job qualification under average circumstances in a regional market. It is understood that there may be unlisted tasks that some employers may require the worker to do in the occupation, when in their employment. In addition, there may be unlisted tasks, such as mental process tasks, that are not stated but that may occur and that should be considered in instructional planning or testing.

Instructors may teach skills and related technical information other than what is shown in the guides. Provision of additional information should be limited to the students who have completed the requirements for the tasks emphasized in the instructional guides. The change of tasks in the guides should be based on task force committee agreement to ensure lateral and vertical articulation.

12. It is expected that there will be updating and correction of items in the articulated instruction guide. Participants are to be sure that the contents are valid and consistent with business and industry requirements. Recommendations should be submitted to the Vocational Articulation Program office which will assemble and present them to the appropriate committee for review and possible adoption.

13. Typically, the teacher/instructor should not plan to conduct instruction in a given articulated module unless the capability exists to conduct all of the instruction to meet the instructional objectives, with the result that the successful student is qualified to perform the tasks identified within the module.

14. An underlying philosophy in vocational training is that it is better to prepare the student to be fully qualified to perform all of the tasks in a limited group of modules in a vocational field and be qualified at a lower job level rather than to be only familiar with a large number of task descriptions or duties and qualified to perform none of them fully. For higher levels of job qualification beyond the secondary level, the student or worker is encouraged to enroll at Greenville Technical College.

15. Generally, vocational programs will include certain basic modules or courses of instruction without which the student would not be considered vocationally qualified at any level. Basic modules typically will be identified and taught early in the program sequence.

16. The instruction guides provides information essential to help the vocational student who completes training at the secondary level and continues career development training at the post-secondary level in a similar program receive appropriate credit for the articulated vocational training that has been mastered at the secondary level.

DEFINITIONS OF TERMS

The following definitions of terms are applicable to the articulated, performance-based instruction guides developed as products of the Occupational Education Articulation Program.

Behavior:	The actions of a person (specifically, job or job training actions). Behavioral actions include both overt, those that can be observed, and covert, those not observable outwardly. Performance may be interchanged with behavior in the project. (See also Performance Actions).
Concept:	A group of ideas that may be classed together or that are similar.
Criteria:	A standard by which performance may be measured, usually considered the minimum standard.
Domain:	A cluster of related jobs.
Duty:	One of the distinct major activities involved in the work performed and comprising related tasks.
Evaluation:	When comparison is made between a measurement and a standard and judgment is passed on the comparison.
Item:	A single stimulus or stimulus pattern that calls for a single response or set of responses. It is one sample of behavior or performance. The response may be simple or complex.
Job:	The duties or tasks actually performed by a specified individual.
Knowledge:	In this project, knowledge refers to acquired covert behavior which facilitates skills and performance, such as the theoretical information of what should be done under given circumstances, and in what order of sequence performance should occur to accomplish the objective.
Measurement:	The process of determining the extent some characteristic is associated with the student.
Module:	Modules in the pilot Drafting and Business and Office Education curriculum modifications in the Occupational Education Articulation Program have been designed to

coincide secondary level training with post-secondary level similar areas of training.

Another method of developing modules might be for modules to represent an identifiable, complicated task or job area involving a number of sub-tasks such as "Electrical Systems" in Automotive Mechanics.

Norm-referenced Evaluation: In norm-referenced evaluation, measures are dependent on a relative standard. Measures compare the capabilities of one student to those of other students.

Objective: (See Performance Objective) A stated desired outcome of training or the end result of the job, task, or performance actions. Objectives referred to in this project will be terminal objectives, generally representing a specific job function.

Occupational Education: An organized sequence of learning experiences consisting of vocational theory, practice, and skills taught to students on a regular or systematic basis.*

*Reference: Standards of the Delegate Assembly (Atlanta: Southern Association of Colleges and Schools, Commission on Occupational Education, December, 1972) p. 12.

Outcome-referenced Evaluation: Outcome-referenced, or criterion-referenced, measurement provides a standard of achievement for the individual as compared with specific behavioral objectives and therefore provides information about the degree of competence attained by the student.

The outcome-referenced measure is a performance or other measure based upon a performance objective, the accomplishment of which measures attainment of that objective.

Performance: Performance is used in this project to refer to a job or task which results from a set of sequential actions or steps.

Performance Actions: A series of steps, generally arranged in a sequence ordinarily followed, which when completed may result in the accomplishment of a performance objective (performance of a task).

Performance actions may be referred to as a set or sets of skills, functions, or steps. V-TEC (Vocational-Technical Education Consortium of States) catalogs generally describe performance actions in the "performance guide" of their format.

Articulated, Performance-based Instruction Guide: A comprehensive collection of performance objectives, performance actions to obtain those objectives, suggested hours for instruction (for planning purposes), performance standards, related technical information, and outcome-referenced measures, as well as general secondary level and post-secondary level descriptions of similar courses for the purposes of aiding lateral and vertical articulation concerning the subject area.

Performance-based Instruction: Performance-based (competence-based) instruction is based on the competencies or tasks performed by on-the-job workers. Everything in a performance-based instruction system is made public beforehand. There are no surprises for student, teacher, counselor, or employer. When the student begins a program, information is available to tell the student exactly what competencies are expected to be developed as a result of the instructional program, how and against what standards or criteria the student will be evaluated, and how the student's competencies will be communicated to the student, instructors, and to employers. A performance-based instructional system tells the student exactly what the student must learn, teaches the student that skill or knowledge, and then tests on mastery of that specific competence.

Performance Objective: A statement in precise, measurable terms of a particular behavior to be exhibited by a learner under specified conditions. It possesses each of the elements or characteristics specified below:

Conditions under which the performance is to take place.

Behavior Desired or expected of the student (things to be done, the performance desired).

Standards to determine how well the performance is to be done (criteria).

Performance Test: A performance test requires the student to demonstrate (master) the desired behavior of the objective (accomplish a job-like task) under controlled conditions and according to predetermined standards. The controlled conditions allow the student to demonstrate the desired behavior and the conditions remain consistent from student to student.

Skill: Primarily, skill refers to overt, observable performance, however, it is recognized that there are covert skills required in some performances.

Step: Step is used to refer to a task or action, generally as a sequence of steps involved in the accomplishment of a performance objective or job.

Systems Approach: The systems approach to instruction emphasizes the specification of instructional objectives, precisely controlled learning experiences to achieve the objectives, criteria for performance, and evaluative information.

Task:	A task is a set of skills (set or sets of functions, actions, or steps) the student must perform to accomplish the job (training). A task may be described as a logically related set of actions necessary or required to complete the job objective. Several tasks could be referred to as a duty.
Task Analysis:	Task analysis is breaking down a learning task (objective) into component tasks each of which must be mastered as a prerequisite to mastery of the total job.
Task List:	A listing of tasks (performance objectives) performed by incumbent workers (students in training) within a domain of interest (course of study).
Test:	An event during which the student is asked to demonstrate some aspect of knowledge or skill is a test. It can be a single test item, but usually it consists of several items.

SUGGESTED CRITERIA
SELECTION OF SCHOLARSHIP STUDENT
TO
GREENVILLE TECHNICAL COLLEGE
MACHINE TECHNOLOGY PROGRAM

There is agreement among the three secondary machine shop instructors that some following criteria should be applied to selecting the "most outstanding or worthy student" from the secondary Machine Shop program to be awarded a scholarship to the Machine Technology Program.

There, however, is a greater need at present to encourage secondary machine shop graduates to continue their vocational education at the post-secondary technical college level. Some of the reasons that students given for not accepting a scholarship or continuing their training include; not being able to afford the minimum costs of books or travel that accompany scholarships, the desire for immediate employment and earning, etc.

INSTRUCTIONS FOR ANSWERING OUTCOME-REFERENCED TEST ITEMS

Typically, eleven (11) different types of outcome-referenced test items may be used in the competency test.

1. True-False
2. Completion (Fill-in Blanks)
3. A Combination of True-False and Completion
4. Multiple-Choice
5. Matching
6. Identification
7. Short Answer
8. Long Answer
9. Program Product of Performance Test
10. Simulated Performance Test
11. Actual Performance Test

An example of each type of test item is included. Carefully study the illustration test item and the directions for answering the question. These directions will not be given again. Your test questions may vary slightly in the format, however, the instruction should be applicable. Where necessary, the instructor will supplement these instructions for answering outcome-referenced test items.

Do not guess. Guessing does not add to your knowledge, even if you happen to guess right. If you do not know the answer skip the test item and go to the next question. Remember: Enter your answers in the blanks provided on the separate answer sheet, if used.

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1. TRUE-FALSE

Directions: Read the statement carefully. Decide whether it is true or false. Answer by marking T or F in the blank provided to the right (or, if answer sheet requires, mark "X" in the appropriate (T) or (F) parenthesis, or "circle" T or F).

Example: Lumber shrinks across the grain of the board. (T) (F)

2. COMPLETION (Fill-in Blanks)

Directions: Complete the statement by printing on the blank line the word or words which make a complete and correct statement.

Example: Proper edge spacing will restrict __?__ and ensure good weld penetration. distortion

3. COMBINATION OF TRUE-FALSE/COMPLETION

Directions: If the statement is correct, in the parenthesis mark (T) or answer true, as required. If the statement is incorrect, mark (F) in the parenthesis and fill in the blank provided with the appropriate word or term which, if substituted for the underlined word, would make the statement correct.

Example: A pantry chef usually is the head chef's first assistant. (T) (F)

sous

4. MULTIPLE-CHOICE

a. Directions: You are given three or four choices from which to make a complete and correct statement. In the blank answer space provided, write in the "letter" indicate the best choice.

Example: The head chef's first assistant is a __?__.

a. junior chef
b. sous chef
c. pantry cook

b

b. Negative Answer Multiple-Choice

Directions: If the multiple-choice question includes the word EXCEPT, you should look for the choice that does not fit the question. Read the entire question carefully before you choose your answer.

Example: All of these could cause high starter current draw EXCEPT:

a. work starter bushing
b. bad starter relay
c. grounded field coils
d. grounded armature

b

5. MATCHING:

Directions: For each given item in the left hand column, match it with the appropriate item from the right hand column. Write the letters of the correct or best answer in the appropriate blanks.

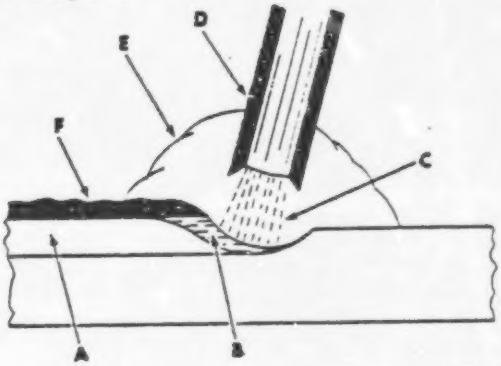
Example: Match these metric terms on the left with their proper equivalents.

b	deca	a.	thousands
c	meter	b.	tens
a	kilo	c.	units of length measurement

6. IDENTIFICATION

Directions: Identify each labeled part of the illustration below and write the name next to the appropriate letter in the blank provided.

Example:



a. base metal
b. molten metal
c. arc
d. electrode
e. gas shield
f. slag

7. SHORT ANSWER

Directions: Write the correct answer in the blank provided.

Example: What type of electrode is best for vertical and overhead welding? fast-freeze

8. LONG ANSWER

Directions: Using as few words as possible, write the answer to the question in the blank provided.

Example: What should be done if the electrode welds fast to the work?

"Electrode should be broken loose by twisting or bending the holder."

9. PROGRAM PRODUCT OR PERFORMANCE TEST

Definition: Concrete project or production accomplishments during training are used to test knowledge or skill. Typically, test pressures are missing and the student may have had help in completing the task.

Directions: Instructor will observe student during training and by checklist or rating scale will rate student's performance or knowledge.

Example: Given an oven for baking, food items, and necessary implements and equipment; load the oven with foods to be baked. All items on a checklist used to rate performance must receive an acceptable rating. The task must be accomplished within 15 minutes.

CHECKLIST

(Load Oven Racks)

ACTIVITY	RATING	
	Acceptable	Unacceptable
1. Gathered needed supplies.		
2. Used needed supplies.		
3. Pulled oven rack partially out while loading.		
4. Stacked oven shelves 8 inches apart for baking.		
5. Placed food on rack so that heat circulated adequately.		
6. Followed appropriate safety precautions.		

10. SIMULATED PERFORMANCE

Definition:	Contrived situation, resembling tasks the graduate will be required to do on the job. This form of test is useful for evaluating transferable skills such as reasoning, attitudes, and psychomotor skills necessary for occupational success.

11. ACTUAL PERFORMANCE TEST

Definition:	Exhibits the advantage of realism, but may be too late to help either the student or the vocational program correct failures.
Example:	Given an automobile with a leaking pinion seal, access to proper tools and equipment, replacement parts, and service manual; replace the pinion seal according to manufacturer's recommended procedures. The job should be completed within 2 hours. The manufacturer's specifications must be met and the completed job must meet the instructor's standards.

ANALYSIS OF SECONDARY INSTRUCTION TIMES

Instruction tasks and times have been described based on a State of South Carolina requirement that 3-hour blocks of instruction total 540 hours per year or 1,080 hours for two year programs.

Vocational programs in career centers typically are conducted on the 3-hour block time frame. Most vocational programs currently are offered for a two year period. Some vocational courses, such as office occupations areas, may be offered for only 1 or 2 hours of training daily.

While the "suggested instruction times" for the tasks in this guide have been allocated based on a 3-hour vocational instruction day, many vocational students in reality are not in the classroom for a full 3 hours. Typically, students must be bused to and from feeder high schools with transit times averaging about 15-30 minutes per trip one way. In addition, students typically are given at least one break during instruction and some instruction time is lost as students change clothes for shop work and then change back into regular school clothing. Add to this lost instruction time an additional time lost due to feeder high school activities, such as 'pep ralleys,' and the resulting vocational instruction day probably is less than 1.5 to 2 hours per day of actual instruction.

Realistically, a total instruction time of from 270 to 360 hours of vocational training probably is more accurate for a one year 3-hour block program than 540 hours.

It is important to recognize this potential situation as vocational instruction is planned and evaluated.

1ST YR. AUTO BODY SYLLABUS

1. Use basic math and communications skills necessary for success in the vocational field.
2. Exhibit a positive awareness of safety practices and safe working habits.
3. Identify career opportunities in the vocational field and related areas.
4. Exhibit qualities of leadership through participation in student organizations such as VICA, HOSA, and FBLA.
5. Identify and properly remove and install automotive fasteners including special types used in trim work.
6. Select and properly use shop reference manuals to locate desired information such as vehicle specifications and parts costs.
7. Identify typical auto frame construction and explain the importance of frame alignment.
8. Identify major panels and parts of the auto body.
9. Select, use, and care for typical auto mechanic and auto body hand tools.
10. Identify and properly use power tools and equipment such as drills, grinders, and pneumatic tools for auto body repair.
11. Identify and properly use automotive shop machinery such as jacks, lifts, and air compressors.
12. Identify and set up oxy-acetylene welding equipment for welding, cutting, and brazing operations.
13. Identify and use electric welding equipment to repair auto bodies.
14. Cut or weld vehicle body panels such as fenders and weld patches to repair body damage.
15. Demonstrate the hammer-on and hammer-off techniques of metalworking and use the pick, file, slide-hammer, spoons, and other tools to correct metal damage.
16. Demonstrate the proper techniques of heat shrinking and cold shrinking metal.
17. Straighten deformed auto body sheet metal on damaged vehicles to specifications.
18. Correctly apply body fillers such as plastics and fiberglass to repair auto bodies with rusted sections or other damage.
19. Use grinders and other equipment and tools to prepare repaired metal for painting.

2ND YR. AUTO BODY
SYLLABUS

1. Identify paint codes and determine materials needed for painting repairs.
2. Prepare metal surfaces for undercoating and develop the proper techniques for featheredging.
3. Mask sections and trim to protect surfaces not being painted.
4. Identify the parts of and clean and adjust the paint spray gun.
5. Demonstrate the proper techniques of applying paint with the spray gun.
6. Apply primer-surfacer undercoats and apply color coats to paint vehicles.
7. Clean and compound a painted surface polishing by hand and with a power buffer.
8. Prepare a paint job for drying.
9. Remove and apply decals and stripes and woodgrain panels and detail the interior and exterior of a repaired vehicle.
10. Remove and replace interior trim, accessories, and hardware such as molding, panel, seats, etc.
11. Remove and replace and align exterior trim, accessories, and hardware such as door, hood, and trunk panels; weatherstripping, bumpers and grilles, and vinyl tops.
12. Using fasteners or welds, disassemble and assemble quarter panels, fenders, doors, and other major parts.
13. Under supervision of the instructor, remove and replace stationary and movable glass in vehicles.
14. Locate and seal leaks around windows.
15. Replace power window regulator assemblies.
16. Identify basic body and frame alighment procedures and repair or replace components of the suspension system.
17. Remove and replace electrical components such as the battery, light assemblies, and horn relays.
18. Troubleshoot, remove, and replace power antennas and solenoids.
19. Distinguish between indirect and direct damage and determine the required repairs and replacement parts for a damaged vehicle.
20. Compute cost of parts and labor for a damaged vehicle and complete a competitive estimate for repair of the vehicle.
21. Follow proven job seeking techniques to secure successful employment in the vocational field.

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BINDER DESIGN

(Occupational Education Articulation Program)

The binder design is simple and straightforward.

Two triangular figures, in balance, represent the two institutions participating in articulation.

Two levels of training are represented by the placement of the triangular figures and the identification of the two institutions.

Horizonal and vertical lines represent lateral and vertical articulation.

The diagonal across the design represents the progressive movement in career development for successful job performance.

The two figures are not closed when they face, but allow for interaction and are linked by the document title: Articulated, Performance-based Instruction Guide.